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Types of Shelled Indo-Pacific Mollusks Described by W. H. Pease

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TYPES OF SHELLED INDO-PACIFIC MOLLUSKS DESCRIBED BY WILLIAM HARPER PEASE (1824–71)

RICHARD I. JOHNSON[1]

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Abstract. Pease described some 500 species of mollusks from the Indo-Pacific region. Of these, some 380 were shell-bearing. Type material was located for all but 42, consisting of syntypes, some previously figured or measured, which have hitherto been regarded as holotypes or selected as lectotypes. Many lectotypes are chosen here and illustrated for the first time. All of the holotypes and lectotypes in the Museum of Comparative Zoology are figured.

INTRODUCTION

The original William Harper Pease collection is in the Museum of Comparative Zoology, Harvard University. After Pease died in 1871, his collection was sent to Boston to be sold "entire." It was offered to a Mrs. Witthaus of New York for $3,000. In a letter to John Gould Anthony, Curator of Mollusks at the Museum of Comparative Zoology, she said that she had seen the collection and found it to be damaged by careless packing. She arranged to purchase only the specimens she wanted, the larger pretty shells (R. D. Turner, personal communication). The remaining collection was sold to Louis Agassiz, director of the Museum of Comparative Zoology. Most of the types and smaller specimens were carefully glued on pieces of glass or slate for exhibition by curator Anthony. This process, as well as the formula for the glue, is included in Turner's (1946) definitive biography of Anthony. In this century, the shells were removed from the plaques by William J. Clench, cataloged, and numbered. Each lot is usually accompanied by labels in Anthony's distinctive and accurate calligraphy as well as one penciled on a scrap of paper by Pease. There is a typewritten list of the collection in the Department of Mollusks compiled by William F. Clapp (1923, Dept. Library, no. 5912), "copied from Pease catalogue written on loose sheets of stationery." Aside from the type material, and that collected by Andrew Garrett, most of the lots have locality data that are so general as to render the specimens useless for study. The Witthaus material became the property of Vassar College, Poughkeepsie, New York, and was presented to the Museum of Comparative Zoology in 1944.

Solem (1976: 9) took such a dim view of the Pease collection that he virtually ignored it when monographing the *Endodontoid Land Snails from Pacific Islands*, preferring to select lectotypes from any other collection that had Pease material, such as the National Museum of Natural History, Washington, D.C., or the Bernice Pauahi Bishop Museum, Honolu-

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lu, even when the material had been originally received from the Museum of Comparative Zoology as duplicates. He claimed that when the collection was shipped "from England [sic] to Harvard University, apparently there was extensive mixing of sets when cabinets were tilted and handled. In subsequent years (obviously referring to duplicates sent out from the Museum of Comparative Zoology rather than by Pease), these shells have been traded widely to other museums and amateur collectors. Virtually all traded Pease material that I examined contained more than one species, living on different islands" (*ibid.*). Solem further declared that "Pease himself was careless in handling his collection since in a letter to a correspondent [Andrew Garrett] wrote that his small daughter delighted in playing with shells in the cabinets" (Alison Kay, personal communication). Kay (1975: 18) had actually quoted Pease as having written, "Our little girl is growing and troubles me in my collections, by assorting my duplicates and arranging them in boxes."

Pease began describing shells in the *Proceedings of the Zoological Society of London,* often remarking that examples were in the collection of Hugh Cuming, who had died in 1865. The Cuming collection was acquired by the British Museum (Natural History). Kay (1965) located all of the available types of the marine species, redescribed them, selected lectotypes when necessary, and figured them, most for the first time. Many of those species not found by Kay were found in the Pease collection and are figured here. Syntypes of all but 14 of the land and freshwater species described in the *Proceedings* were located in the Museum of Comparative Zoology. None of those missing could be located in the British Museum (Natural History) (P. B. Mordan, *in litt.*). Clench (1975) listed all of the Pease taxa but made no effort to supply any information as to the location of any of the type specimens, neither those in the British Museum (Natural History) nor those described in the *Journal de Conchyliologie,* which were sent to H. Crosse, who translated the papers into French. Fischer-Piette (1950) listed all of the types that had been in the collection of the *Journal,* and later presented them to the Muséum National d'Histoire Naturelle, Paris, figuring those not done so previously. Clench also did not notice that Baker (1963, 1964), who listed all of the land and freshwater types in the Academy of Natural Sciences of Philadelphia, included those by Pease described in the *American Journal of Conchology.*

After the death of Cuming, Pease chose P. P. Carpenter to sponsor his publications in the *Proceedings of the Zoological Society,* but Carpenter (*in* Pease, 1865a: 675–676) included a list of synonyms based on specimens Pease sent to Cuming determined by Cuming and H. Adams. Later (*in* Pease, 1865d: 516–517), Carpenter published a list of synonyms based on his own observations. This ended their relationship. It was not until 1872 that another paper by Pease appeared in the *Proceedings.* In it were described 14 new species of *Triphoris,* none of which were sent to the British Museum (Natural History). Twelve of them were found in Pease's collection and are figured here for the first time. While the opisthobranch mollusks that are shell-less are not included in the following list, those that were studied by Pruvot-Fol (1947) have been noted in the accompanying index of all of the Pease taxa.

William Harper Pease was born in Brooklyn, New York, in January 1824. He joined the Lyceum of Natural History of New York in 1841; traveled with General Winfield Scott to Mexico in 1848, his assignment a matter of conjecture; arrived in Honolulu on December 11, 1849; and in 1850 applied for citizenship in the Hawaiian Kingdom, purchased land, and became Local Agent of the Government on the island of Kauai. Little else is known about him to this time. Returning to Honolulu about 1856, Pease became Commissioner of Water Rights and Rights of

Way as well as Assessor of the City of Honolulu, though Solem (1976–77) thought he was a merchant. His main interest was natural history, especially the shells of the Pacific. In a letter of 1865, quoted by Kay (1975: 6), he wrote, "That is all I think or care about." Prominent among his friends was Levi Haalelea, Chamberlain to the Court. He kept his shell collection, library, and an office in Haalelea's home opposite the Palace. When Haalelea died in 1865, Pease moved the library to a small building adjoining his own house at 25 Liliha Street.

Most of the material that Pease described after 1860 was collected by Andrew Garrett (1823–87), whom Solem (1976: 7) mistakenly thought was a missionary. Garrett was actually a self-trained naturalist, who had spent some of his life as a sailor before becoming a professional collector of shells, fishes, and other natural history objects of the South Pacific Islands. He arrived in Honolulu in 1852 and later moved to the island of Hawaii, where he remained, except for collecting trips to other Pacific Islands, until 1863 when he settled permanently in the Society Islands. While in the Hawaiian Islands he became a close friend and employee of Pease, and the two carried on an active correspondence until the death of the latter in 1871.

Garrett collected for Louis Agassiz of the Museum of Comparative Zoology, for the Museum Godeffroy, Hamburg, and for Pease, who sponsored his trips in part and acted as his agent in Honolulu. He sent Pease descriptions of shells and nudibranchs, which the latter used in his publications.

> The relations of these two men was friendly, although Pease took almost a paternalistic attitude toward Garrett. There was a difficult side for Garrett. It is true that, in a sense, he was an employee of the other man, but in some ways Pease seems to have taken advantage of Garrett's abilities and efforts. The latter worked hard and assiduously. He collected amid the most trying and dangerous conditions. He scrupulously described and drew pictures of many of the specimens gathered, particularly the fishes. In the case of fishes and shells he suggested the scientific names. But despite all this, he lived in the shadow of Pease, while the more articulate writer and more assertive man earned the glory. (Thomas, 1979: 20)

After the death of Pease, beginning in 1872 until his death in 1887, Garrett began publishing his own descriptions of new species and monographs of various groups of mollusks, which included much more accurate locality data than those given by Pease.

Few details of the life of Pease are repeated here. His biographer, Karl W. Greene (1960), based his account on the letters Pease wrote to Garrett, which, along with the latter's shell collection, are now in the Bernice Pauahi Bishop Museum, Honolulu. While details of the purchase of the Garrett collection are lacking, it was in the museum by 1899. Kay (1975) also wrote a biography of Pease. Although Greene (1960 (8): 12) mentioned Kay's arrival in Honolulu, and while she must have been aware of his articles in *Hawaiian Shell News,* Kay did not allude to Greene's work.

The life and travels of Andrew Garrett are treated definitively by W. Stephen Thomas (1979), who devoted many years to the study. Thomas' interest in Garrett was inspired by his obtaining from some of his cousins over 250 drawings of fishes and shells that Garrett had made for Captain John W. Leonard of the whaleship *Lydia*. Clench (1979) listed all of the mollusks described by Garrett but again did not make any effort to locate his type specimens, many of which are in the Academy of Natural Sciences of Philadelphia, the Museum of Comparative Zoology, and, of course, the Bishop Museum.

Kay (1975: 18) mentioned that neither portrait nor photograph of Pease had ever been found, but that Lady Franklin, the widow of Sir John Franklin, the Arctic explorer, met Pease at the plantation of Robert G. Wyllie, a Scotsman who was Kamehameha IV's minister of foreign affairs. Lady Franklin wrote,

> I find it so difficult to make out what he says that much is lost to me—this proceeds partly perhaps from a want of some teeth in front of his mouth,

> but chiefly from his holding and chewing tobacco which not only thickens his speech, but causes him to be constantly spitting. (Korn, 1958)

Perhaps, it is just as well that no portrait was found.

In spite of his appearance, Pease seems to have moved in the best circle of Hawaiian society of the time. As already mentioned, he was an intimate of Levi Haalelea, an acquaintance of Robert G. Wyllie, Minister of Foreign Affairs, and James Walker Austin, sometime Associate Justice of the Supreme Court of the Kingdom of Hawaii. Austin, a relative of my children, was executor of all of the preceding estates including that of Pease (Austin, 1921: 64).

REMARKS

For convenience the following list of taxa is arranged alphabetically by species name. It contains references only to those that are shelled: a complete list of molluscan names introduced by Pease was compiled by Clench (1975) and may be found here in the Index alphabetically by genus with supplemental data. In addition to the original reference, subsequent ones are also cited if they include the first figure of a type or other relevant information. More detailed locality information is included from subsequent references by both Pease and Garrett, the latter having collected most of the material.

Pease put a question mark before some genera when he was not sure where the species belonged. A generic name in parentheses is a second citation indicating that he later changed the generic placement. Data in brackets have been found on original labels, are additions or corrections from recent maps, or are comments by this author. No attempt has been made to discuss the present status of any of the taxa. This is a task for individual revisers.

In the past, if Kay (1965), Fischer-Piette (1950), Baker (1963, 1964), Houbrick (1992), or the present author was able to locate the single figured or measured syntype, it was usually regarded as the holotype. Most of these designations, included in this paper, were made long before the promulgation of the third edition of the *International Code of Zoological Nomenclature* (1985), which invalidates this practice under Article 74 (b): ". . . should another syntype or syntypes be discovered [the first subsequent author is to be regarded] to have chosen a lectotype." If this change is to be made it is left here, in these instances, to the first subsequent reviser.

Baker (1963, 1964) listed all of the types of land snails in the Academy of Natural Sciences of Philadelphia and used his own system of abbreviations for type designations, which have been interpreted here as follows:

TOD	type by original designation [holotype]
TOM	type because only one example was included in the original description, or was indicated by only one set of dimensions . . . [holotype]
TSD	type by subsequent selection, followed by "now" if apparently first designated in these lists . . . [lectotype]

At the request of Dr. Gary Rosenberg, of the Academy of Natural Sciences of Philadelphia, all of the types, either figured for the first time or refigured, are regarded as lectotypes in compliance of *ICZN* 74 (b).

Unless previously selected as lectotypes by someone else, the types of the species of genus *Partula* from the Society Islands have been included only as syntypes, because so many were regarded as mere color forms by Crampton (1916, 1932) and because most of these are now extinct (Tudge, 1992).

Pease introduced a number of names in the literature that are believed to be nude. When these were represented by specimens, the number of the lot is included. These specimens are of no significance unless, peradventure, the taxa were subsequently validated by another author and overlooked by the present one. Several of the land shells from the Society Islands are known only from the specimens figured by Garrett (1884) and are regarded as lectotypes. Examples of some of the described taxa that are missing may occur in the Garrett collection in the Bernice Pauahi Bishop Museum under the names of Pease and, while not exactly strictly speaking types, might serve as neotypes.

ACKNOWLEDGMENTS

It gives me great pleasure to thank those people whose cooperation eased the task of gathering information. Peter Mordan, of the Mollusca Section, British Museum (Natural History), was able to inform me that certain of the 14 non-marine mollusks not in the Pease collection were represented in that collection and Ms. Kathie Way supplied other data. Drs. George M. Davis and Gary Rosenberg of the Academy of Natural Sciences of Philadelphia answered every request for material and data, and there were many; Ms. Doree Bardes also helped. Dr. Alison Kay left a number of helpful notes in many lots of the marine types in the Museum of Comparative Zoology in conjunction with her work (1975). Mr. Tan Koh Siang identified the types of *Sistrum triangulatum,* which otherwise would have been overlooked. With the exception of two photographs by Dr. James H. McLean, Los Angeles County Museum of Natural History, and two others by Dr. Kenneth J. Boss, all of the photographs and measurements were made by Dr. Silvard P. Kool. Dr. Kenneth J. Boss made many helpful suggestions. Finally, thanks are extended to Mrs. Marion D. Britz, who copied and recopied as many corrected copies of this manuscript as did Sonia Tolstoy of *Anna Karenina*. Drs. Alan R. Kabat and Gary Rosenberg kindly reviewed the manuscript and made a number of frank criticisms that saved this author from some really egregious errors. I would also like to thank Drs. C. C. Wang, William U. Shipley, Merrill Goldstein, Mandel E. Cohen, and Blair Ardman. Publication costs of this study were covered in part by the Wetmore Colles Fund.

ABBREVIATIONS

In general, this author disdains references that merely give a date, forcing the use of the bibliography over and over. To partially alleviate this problem, the principal references are cited in the catalog by the following abbreviations.

ACM	*Annals of the Carnegie Museum*
AJC	*American Journal of Conchology*
ANSP	Academy of Natural Sciences of Philadelphia, Philadelphia, Pennsylvania
BMCZ	*Bulletin of the Museum of Comparative Zoology,* Cambridge, Massachusetts
BMNH	British Museum (Natural History)
BPBM	Bernice Pauahi Bishop Museum, Honolulu, Hawaii
CM	Carnegie Museum, Pittsburgh, Pennsylvania
JANSP	*Journal of the Academy of Natural Sciences of Philadelphia*
JdeC	*Journal de Conchyliologie*
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MofC	*Manual of Conchology*
PZS	*Proceedings of the Zoological Society of London*
USNM	National Museum of Natural History, Washington, D.C.

Titles of other journals cited in the catalog are usually given in full.

LIST OF THE TAXA OF SHELLED MOLLUSKS DESCRIBED BY PEASE

abbreviata, Partula

1865a, PZS for 1864: 675 [*nomen nudum*]. MCZ 2505.

abbreviata, Planaxis Plate 9, Figure 2

1865d, PZS for 1865: 515 (Islands of the Central Pacific); 1868g, AJC **4:** 101, pl. 12, fig. 16 (Tahiti). Lectotype, here selected, ANSP 18261; paralectotypes MCZ 187833 (Plate 8, Figure 13) and 187834; not located in BMNH by Kay (1965: 86).

abbreviata, Realia

1865a, PZS for 1864: 674 (Islands of the Central Pacific); 1869a, JdeC **17:** 155, pl. 7, fig. 5, as *Omphalotropis* (Tahiti). Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74936 and 187842.

acetabulum, Helix

1861d, PZS for 1861: 242 (Tahiti). Holotype ANSP 47844a, *teste* Baker (1963: 231) selected as lectotype by Solem (1976: 357, figs. 156d–f); paralectotypes MCZ 17248 and 176567.

aciculata, Eulima

1861b, PZS **28:** 438 (Sandwich Islands). Lectotype BMNH 1962839 selected by Kay (1965: 66, pl. 9, fig. 2); paralectotype MCZ 31705 figured by Pilsbry (1917: 222, figs. 11a, b); paralectotype MCZ 187747.

aculeata, Scutellina Plate 1, Figure 9

1868g, AJC **4:** 100 (Hawaii [Island]). Lectotype, here selected, MCZ 83720 labeled as holotype.

affine, Sistrum

1863b, PZS for 1862: 244 (Kingsmill Islands); 1868d, AJC **3:** 277, pl. 23, fig. 13. Lectotype BMNH 1964304 selected by Kay (1965: 79, pl. 13, figs. 13, 14).

affinis, Partula

1865a, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 224 (Tahiti). Holotype ANSP 59560a, *teste* Baker (1963: 204); paratypes MCZ 25313.

affinis, Realia

1865e, AJC **1:** 288 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 4 (Hervey Isles); Pease, 1869a, JdeC **17:** 152 as *Omphalotropis* (Aitutake, Hervey Isles). Holotype ANSP 13346a, *teste* Baker (1964: 178); paratypes MCZ 187840 and 187841.

affinis, Triphoris

1861b, PZS **28:** 434 ([Kauai] Sandwich Islands). Holotype BMNH 1962808 figured by Kay (1965: 51, pl. 10, fig. 1); paratypes MCZ 50074.

alba, Thala Plate 9, Figure 20

1868a, AJC **3:** 215, pl. 15, fig. 8 (Paumotus). Lectotype ANSP 28755 selected by Cernohorsky (1976: 501, pl. 450, fig. 6); three paralectotypes ANSP 325385; paralectotypes MCZ 260612.

albinea, Helicina maugeriane

1871d, PZS for 1871: 466 (Raiatea [restricted to a single valley on the east side of Tahaa, *teste* Garrett, 1884: 101, pl. 3, fig. 64]). Lectotype, here selected, ANSP 14538 is the specimen figured by Garrett; five paralectotypes MCZ 202599 from Garrett; not located in BMNH, *teste* Mordan, personal communication.

albocincta, Engina

1860b, PZS **28:** 142 (Sandwich Islands). Lectotype BMNH 1961454 selected by Kay (1965: 16, pl. 2, figs. 9, 10); paralectotypes MCZ 297948.

alta, Helix

1868j, AJC **4:** 153, pl. 12, fig. 1 (Ponape). Holotype ANSP 49016, *teste* Baker (1963: 233); paratypes MCZ 94770.

alternata 'Pease' H. H. Smith, *Partula*

1865a, PZS for 1864: 675 [*nomen nudum*]; 1902, ACM **1:** 447 (Moorea). Syntypes MCZ 25069.

alternata, Triphoris

1861b, PZS **28:** 434 ([Kauai] Sandwich Islands); 1868h, AJC 4: 127 non Adams 1852. Changed to: *Triphoris bicolor*. Lectotype BMNH 1962815 selected by Kay (1965: 54, pl. 10, fig. 4); paralectotypes MCZ 50057 and 73735.

ambigua, Limnaea

1870b, AJC **6:** 6, pl. 3, fig. 5 (Hawaiian Islands). Holotype ANSP 21240a, *teste* Baker (1964: 152); paratypes MCZ 73469.

ambusta, Auriculella Plate 2, Figure 10

1868f, JdeC **16:** 345 ([Waianae Mountains, Oahu]). Lectotype, here selected, MCZ 45152; paralectotypes MCZ 298488.

analogica, Pithys

1870c, JdeC **18:** 396 (Marquesas [Islands]); 1871b, PZS for 1871: 454. Lectotype BPBM 115307 from MCZ 17260 selected by Solem (1976: 328, figs. 143a–d); paralectotypes MCZ 17260.

angasii, Rissoina

1871e, AJC **7:** 20. New name for *turricula* Angas 1867 non Pease 1860.

angicostata, Hindsia

1860b, PZS **28:** 142 (Sandwich Islands). Lectotype BMNH 1961159 selected by Kay (1965: 16, pl. 1, figs. 15, 16).

angiostoma, Cythara

1868h, AJC **4:** 105. New name for *Pleurotoma triticea* Reeve 1843 non Kiener 1839.

angiostoma, Thala Plate 9, Figure 22

1868a, AJC **3:** 216, pl. 15, fig. 9 (Paumotus). Lectotype, here selected, ANSP 28754; paralectotypes MCZ 256500.

angulata, Carelia adusta

1870c, JdeC **18:** 403 (Kauai). Lectotype ANSP 23434 selected by Baker (1963: 197) figured by Hyatt and Pilsbry (1911: 116, pl. 20, fig. 16); paralectotypes MCZ 45167.

angulatus, Euchelus Plate 7, Figure 13

1868d, AJC **3:** 283, pl. 23, fig. 27 (Annaa Island). Lectotype, here selected, ANSP 40671 is the figured type; two paralectotypes ANSP 391031; paralectotypes MCZ 89796.

annectens, Bulimus [*Partula*]

1865a, PZS for 1864: 671 (Islands of the Central Pacific [two valleys on the west coast of Huaheine, *teste* Garrett, 1884: 66]). Syntypes MCZ 26352.

antiqua, Leptachatina

1870a, JdeC **18:** 94 (Kauai); Crosse, 1876, JdeC **24:** 97, pl. 3, fig. 6. Holotype in MNHN, *teste* Fischer-Piette (1950: 149).

aperta, Haminea Plate 4, Figure 17

1868e, AJC **4:** 72 (Tahiti). Lectotype, here selected, ANSP 57575.

aperta, Tornatellina Plate 2, Figure 18

1865b, PZS for 1864: 673 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahiti). Lectotype, here selected, MCZ 175722; paralectotypes MCZ 298457.

approximata, Nassa Plate 8, Figure 4

1868d, AJC **3:** 272, pl. 23, fig. 3 ([Ascension Island]).

Lectotype MCZ 151800 selected by Cernohorsky (1984: 128, pl. 23, fig. 13); paralectotype MCZ 303191.

approximata 'Pease' Garrett, *Partula*

1884, JANSP (2) **9:** 75 (several small valleys on the south west part of Raiatea). Lectotype ANSP 59451a selected by Baker (1964: 204) figured by Pilsbry (1909: 243, pl. 17, fig. 15); paralectotypes MCZ 50851, 24927, and 25197.

approximata, Turricula

1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1961192 selected by Kay (1965: 27, pl. 3, figs. 1, 2).

argutus, Bulimus [*Partula*]

1865b, PZS for 1864: 670 (Islands of the Central Pacific [Huaheine, *teste* Garrett, 1884, JANSP (2) **9:** 62, pl. 3, fig. 57]). Syntypes MCZ 26353.

armata, Vertigo

1871d, PZS for 1871: 461 (Bolabola [Borabora Island, Society Islands]). Holotype MCZ 48315 figured by Pilsbry and Cooke (1920: 327, pl. 30, figs. 12, 13); paratypes MCZ 31398.

armatus, "?" Acanthochites Plate 1, Figure 1

1872a, AJC **7:** 195 ([Pauloa] Oahu). Holotype MCZ 73452, only specimen.

asperum, Cerithium

1861b, PZS **28:** 433 (Sandwich Islands). Holotype BMNH 1961203 figured by Kay (1965: 47, pl. 5, figs. 11, 12); paratype MCZ 239650.

assimilis, Mitra Plate 7, Figure 20

1868a, AJC **3:** 211, pl. 15, fig. 1 ([Oahu] Polynesia). Lectotype ANSP 28718 selected by Cernohorsky (1976: 487, pl. 436, fig. 1) and the type locality restricted to: Huahine [*sic*] Island, Society Islands; paralectotypes MCZ 260601 and 260603; paralectotype ANSP 391048.

assimilis, Partula

1868b, AJC **3:** 230, pl. 15, figs. 28, 29 [both as 28] (Roratonga); 1870c, JdeC **18:** 401. Syntypes MCZ 24906 and 25137; not located in ANSP by Baker (1963: 204).

assimilis, Terebra

1869d, AJC **5:** 67 (Oahu); 1871e, AJC **7:** 20 is *Terebra contigua* Pease 1871, new name for *T. assimilis* non Angus 1867. Not located in ANSP.

atiensis, Pithys Plate 2, Figure 8

1870c, JdeC **18:** 394 (Atiu [Island, Cook Islands]); 1871d, PZS for 1871: 453. Lectotype, here selected, MCZ 17335; paralectotypes MCZ 17336.

atra, Planaxis Plate 9, Figure 1

1869d, AJC **5:** 72, pl. 6, fig. 4 (Marquesas [Islands]). Lectotype, here selected, ANSP 18282; three paralectotypes ANSP 391038; paralectotypes MCZ 187836 and 187837.

attenuata, Cirsotrema.

1861a, PZS **28:** 400 (Sandwich Islands). Lectotype BMNH 1962796 selected by Kay (1965: 43, pl. 10, figs. 9, 10).

attenuata, Partula

1865a, PZS for 1864: 672 (Islands of the Central Pacific [Tahiti]). Syntypes MCZ 24901 and 25047.

aurantium, Operculatum

1868d, AJC **3:** 287 (Hawaii [Island]). Not located in ANSP.

australis, Tritonidea

1871e, AJC **7:** 21 (Australia). New name for *Tritonidea assimilis* Angas 1867 non *Buccinum assimile* Reeve 1846.

bacca, Vertigo

1871d, PZS for 1871: 462 (Kalapana [Puna District] Hawaii Island); specimens lost, *teste* Pease.

baetica 'Pease' Paetel, *Lampania*

1887, *Catalog der Conchylien-Sammlung* (Berlin) **1:** 351 [*nomen nudum*].

balteata, Clathurella

1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962786 selected by Kay (1965: 34, pl. 5, figs. 3, 4); paralectotypes MCZ 50004.

balteata, Leptachatina

1870a, JdeC **18:** 91 ([Waimea] Kauai); Crosse, 1876, JdeC **24:** 97, pl. 4, fig. 4. Holotype in MNHN, *teste* Fischer-Piette (1950: 149); paratypes MCZ 142986.

balteata, Nassa

1869d, AJC **5:** 71, pl. 8, fig. 4 (Ebon Island). Lectotype, here selected, ANSP 16366 is the figured type.

balteata, Rissoina

1869d, AJC **5:** 72 (Hawaii [Island]). Not located in ANSP.

bella, Daphnella

1860b, PZS **28:** 147 (Sandwich Islands). Lectotype BMNH 1962786 selected by Kay (1965: 34, pl. 5, figs. 3, 4); paralectotypes MCZ 50013 and 50014.

bella, Helicina

1865a, PZS for 1864: 676 [*numen nudum*]. MCZ 297930.

bella 'Pease' Hartman, *Partula*

1871a, PZS for 1871: 473 [*nomen nudum*]; 1881, BMCZ **9:** 193 ([Raiatea]). Syntypes MCZ 3639.

bella, Turricula

1860b, PZS **28:** 145 (Sandwich Islands). Lectotype BMNH 1961204 selected by Kay (1965: 26, pl. 3, figs. 12, 14); paralectotypes MCZ 50017.

biangulatum, Cyclostoma Plate 2, Figure 13

1865a, PZS for 1864: 674 (Islands of the Central Pacific [Aitutaki, Cook Islands, *teste* Garrett (1881: 404) who collected the specimens]). Lectotype, here selected, MCZ 141031; paralectotypes MCZ 141032.

bicarinata, Amathina

1861a, PZS **28:** 399 (Sandwich Islands). Lectotype BMNH 1962792 selected by Kay (1965: 40, pl. 6, figs. 3, 4).

bicarinata, Clathurella Plate 6, Figure 17

1863c, PZS for 1862: 243 (Kingsmill Islands); 1868a, AJC **3:** 222, pl. 15, fig. 23. Lectotype, here selected, ANSP 15806; not located in BMNH by Kay (1965: 86).

bicolor, Partula

1871f, AJC **7:** 26, pl. 9, fig. 4 (Guam). Syntype MCZ 25345; not located in ANSP by Baker (1963: 204).

bicolor, Triphoris

1868h, AJC **4:** 127. New name for *Triphoris alternata*

Pease 1860 non C. B. Adams 1852. See under: *alternata, Triphoris.*

bifasciata, Borsonia
1860b, PZS **28:** 143 (Sandwich Islands). Holotype BMNH 1962758, *teste* Kay (1965: 18, pl. 8, figs. 4, 5).

bilineata, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 201 (Tahaa [confined to Faa-apa Valley on the east coast, *teste* Garrett, 1884: 62]); 1867a, AJC **3:** 81, pl. 1, fig. 10; 1871b, PZS for 1871: 473 (Tahiti). Lectotype ANSP 59438a selected by Baker (1963: 204) is the figured type; paralectotypes MCZ 24903.

bipes, Syphonota
1860a, PZS **28:** 23 (Sandwich Islands). Syntype MCZ 297867; not located in BMNH by Kay (1965: 84).

boeticum, Cerithium
1861b, PZS **28:** 433 (Sandwich Islands). Lectotype BMNH 1962802 selected by Kay (1965: 48, pl. 10, fig. 8).

brazieri, Helicina Plate 5, Figure 11
1870c, JdeC **18:** 397 (Niue [Island]). Lectotype, here selected, MCZ 74947; paralectotypes MCZ 298500.

brazieri, Partula
1871f, AJC **7:** 27, pl. 9, fig. 5 (Tutuila). Holotype ANSP 59846, *teste* Baker (1963: 204).

brevicula, Leptachatina
1869c, JdeC **17:** 169 (Kauai). Measured holotype and paratype in MNHN, *teste* Fischer-Piette (1950: 72); paratype ANSP 57802 figured by Cooke (1910: 24, pl. 8, fig. 54); paratype MCZ 45195.

brevicula 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 48 (Faahuaite Valley, Tahiti). Lectotype ANSP 59558a selected by Baker (1963: 204) figured by Pilsbry (1909: 191, pl. 26, fig. 12); paralectotypes MCZ 24997.

brevis, Cithara [*Cythara*] Plate 6, Figure 10
1868a, AJC **3:** 217, pl. 15, fig. 11 ([Anaa Island] Paumotus). Lectotype, here selected, ANSP 15652 is the figured type; paralectotype ANSP 391038; paratypes MCZ 49988 and 49989.

brunnea, Avicula Plate 1, Figure 3
1863c, PZS for 1862: 244 ([Molokai] Sandwich Islands). Lectotype, here selected, MCZ 298465; paralectotypes MCZ 297881; not located in BMNH by Kay (1965: 86).

brunnea, Clathurella
1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962763 selected by Kay (1965: 19, pl. 8, figs. 1–3); paralectotypes MCZ 50006 and 50007.

brunnea, Strigatella Plate 9, Figure 10
1868a, AJC **3:** 215, pl. 15, fig. 7 ([Paumotus] Polynesia). Lectotype, here selected, ANSP 29722 is the figured type; five paralectotypes ANSP 391049; paralectotype MCZ 260610.

brunneus, Triphoris Plate 10, Figure 6
1871a, PZS for 1870: 777 (Apaiang [Abaiang Island]). Lectotype, here selected, MCZ 73922.

buccinoides, Clathurella
1860d, PZS **28:** 144 (Sandwich Islands). Holotype BMNH 1961156, *teste* Kay (1965: 23, pl. 2, figs. 1, 2).

calliostoma, Helicina Plate 5, Figure 5
1871d, PZS for 1871: 466 (Marquesas [Islands]). Lectotype, here selected, MCZ 74950; paralectotypes MCZ 298501.

canaliculata, Clathurella Plate 6, Figure 16
1868a, AJC **3:** 219, pl. 15, fig. 17 (Paumotus). Lectotype, here selected, MCZ 231978; paralectotypes MCZ 303197; not located in ANSP.

cancellata, Coralliobia
1861a, PZS **28:** 399 (Sandwich Islands), "only a single dead specimen found." Not located in BMNH by Kay (1965: 86).

cancellata, Scutellina
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype BMNH 1962833 selected by Kay (1965: 64, pl. 11, figs. 8, 9).

cancellatus, Strombus
1861a, PZS **28:** 398 (Sandwich Islands). Lectotype BMNH 1961180 selected by Kay (1965: 40, pl. 4, figs. 8, 9).

candida, "?" Collonia
1861b, PZS **28:** 436 (Sandwich Islands). Lectotype BMNH 1962826 selected by Kay (1965: 61, pl. 9, fig. 8); paralectotypes MCZ 245260.

candida, Cypraea
1865d, PZS for 1865: 515 (Islands of the Central Pacific); 1868g, AJC **4:** 95, pl. 11, figs. 12, 13 (Apaian Island). Lectotype BMNH 1964318 selected by Kay (1965: 83, pl. 14, figs. 3, 4); paralectotypes MCZ 297949.

candida, Volvatella
1868e, AJC **4:** 73, pl. 7, fig. 6 ([Tahiti] Polynesia). Syntypes MCZ 297940, mostly fragments.

capillata, Helix Plate 2, Figure 1
1866b, AJC **2:** 292 (Sandwich Islands); 1871b, PZS for 1871: 474 as *Pitys* (Kauai). Lectotype ANSP 1975a (now 1975) selected by Solem (1976: 368 [not figured]) is the measured type, *teste* Baker (1963: 232); paralectotypes MCZ 17585.

castanea 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 75 (Faaloa, on the east coast [of Raiatea]). Lectotype ANSP 59977a selected by Baker (1963: 204) figured by Pilsbry (1909: 244, pl. 17, fig. 2); paralectotypes MCZ 297856.

celsa, "?" Pithys
1870c, JdeC **18:** 396 (Raiatea); 1871b, PZS for 1871: 445 as *Endodonta.* Lectotype BPBM 3484 selected by Solem (1976: 358, figs. 158a–c); paralectotypes MCZ 17243 and 17249.

cerithiopsis, Rissoina
1862b, JdeC **10:** 382 [*nomen nudum*].

cincta, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*].

cinctus, Melampus
1865a, PZS for 1864: 676 [*nomen nudum*].

cinerea, Littorina
1869d, AJC **5:** 78, pl. 8, fig. 14 (Marquesas [Islands]). Lectotype, here selected, ANSP 18811 is the figured type.

cingulifera, Triphoris
1861b, PZS **28:** 434 ([Haena Point, Kauai] Sandwich Islands). Lectotype BMNH 1962812 selected by Kay

(1965: 52, pl. 6, figs. 9, 10); paralectotypes MCZ 50056, 50076, and 73737.

citrina, Partula
1865b, PZS for 1864: 675 [*nomen nudum*] 1866a, AJC **2:** 195 (Tahitian Archipelago [restricted to a single valley called Uparu on the west coast of Raiatea, *teste* Garrett, 1884: 64]). Syntypes MCZ 24885 and 25027.

clara, Partula
1865b, PZS for 1864: 671 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahiti). Syntypes MCZ 24931 and 25141.

clathrata, Emarginula
1863b, PZS for 1862: 241 (Pacific Islands); 1868g, AJC **4:** 99, pl. 11, fig. 24 (Howland Island). Lectotype BMNH 1964290 selected by Kay (1965: 74, pl. 12, fig. 11); paralectotypes MCZ 179161.

clavata, Triphoris
1861b, PZS **28:** 434 (Sandwich Islands). Lectotype BMNH 1962814 selected by Kay (1965: 53, pl. 10, fig. 2); paralectotype MCZ 50060.

cognata 'Pease' Garrett, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; 1884, JANSP (2) **9:** 67, 68 (Faahiti Valley, Huaheine). Specimens figured by Pilsbry (1909: 254, pl. 22, figs. 12, 17; pl. 33, fig. 3). Lectotype ANSP 59991a selected by Baker (1963: 204); paralectotypes MCZ 24817 and 25117.

colorata, Helicina
1868j, AJC **4:** 156, pl. 12, fig. 9 (Annaa [Island]). Holotype ANSP 145541a, *teste* Baker (1964: 101); paratypes MCZ 297929.

compacta, Labiella Plate 4, Figure 5
1869c, JdeC **17:** 172 ([Palauea] Maui; Coll. [of] Pease). Lectotype, here selected, MCZ 45196; paralectotype MCZ 298489.

compacta, Limnaea
1870b, AJC **6:** 6, pl. 3, fig. 4 (Oahu). Syntypes MCZ 302381; not located in ANSP by Baker (1964: 151). Is *Physa mexicana* Philippi [introduced], *teste* D. W. Taylor, personal communication.

compacta, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 200 (Raiatea [Hamoa Valley on the east coast of Raiatea, *teste* Garrett, 1884: 55]); 1867a, AJC **3:** 81, pl. 1, fig. 9. Lectotype ANSP 59983 selected by Baker (1963: 204) is the figured type; paralectotypes MCZ 24993.

complanatum, Registoma Plate 4, Figure 3
1861c, PZS **28:** 440 (Ebon Island). Lectotype, here selected, MCZ 141018; paralectotypes MCZ 141019.

compressa, Scutellina Plate 1, Figure 10
1868g, AJC **4:** 99, pl. 11, figs. 25, 27 (Tahiti). Lectotype, here selected, MCZ 302552.

compta, Cypraea
1860c, PZS **28:** 189 (Jarvis Island). Holotype BMNH 1964276, *teste* Kay (1965: 36, pl. 12, figs. 1, 2).

compta, Partulina
1869c, JdeC **17:** 175 (Molokai). Holotype in MNHN figured by Fischer-Piette (1950: 73, fig. 54); paratypes MCZ 25826 and 25828.

concinna, Partula
1872a, AJC **7:** 196 (New Hebrides). Though not a type Carnegie Museum 4244, "Tanna Island, New Hebrides [Vanuatu] (Cox)" was figured by Hartman (1886: 35, pl. 2, fig. 16) as this species and by Pilsbry (1909: 288, pl. 36, figs. 9, 12); not located in ANSP by Baker (1963: 204).

concinna, Truncatella Plate 10, Figure 18
1871d, PZS for 1871: 468 (Apaiang [Abaiang Island, Kingsmill Islands]). Lectotype, here selected, MCZ 178650; paralectotypes MCZ 298459.

congrua, Helix Plate 2, Figure 4
1868j, AJC **4:** 154, pl. 12, figs. 3, 4 (Ponape); 1871b, PZS for 1871: 457 as *Trochomorpha contigua* to replace *H. congrua* 1868 non Pfeiffer 1858. Lectotype, here selected, MCZ 12161; paralectotypes MCZ 12159 and 297861; not located in ANSP by Baker (1963).

conica, Laimodonta
1863b, PZS for 1862: 242 (Pacific Islands); 1868g, AJC **4:** 101, pl. 12, fig. 15 (Paumotus); 1871b, JdeC **19:** 94 (Annaa). Lectotype ANSP 22610a selected by Baker (1964: 151) is the figured type; a lectotype BMNH 1964292 was also subsequently selected by Kay (1965: 75, pl. 13, figs. 7, 8).

conica, Torinia
1865d, PZS for 1865: 514 (Islands of the Central Pacific). Not located in BMNH by Kay (1965: 86).

conoidalis, Tectura Plate 1, Figure 6
1868g, AJC **4:** 98, pl. 11, fig. 22 (Roratonga [Island]). Lectotype, here selected, MCZ 302558; paralectotypes MCZ 298470; specimens identified by Pease from a different locality [idiotypes] ANSP 40993.

conoidalis, Trochus Plate 9, Figure 26
1868d, AJC **3:** 287, pl. 24, fig. 8 (Paumotus). Lectotype, here selected, ANSP 18868 is the figured type; three paralectotypes ANSP 267209; paralectotypes MCZ 104618, 150597, and 298236.

consimilis, Helix
1865b, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 227 (Tahiti [error for Raiatea]). Lectotype BMNH 71.1.5.28 selected by Solem (1976: 174 [not figured]); paralectotypes MCZ 17262 and 297952.

conspersa, Bulla
1869d, AJC **5:** 72, pl. 8, fig. 9 (Marquesas [Islands]). Lectotype, here selected, ANSP 57505 is the figured type; paralectotypes MCZ 297880 and 298464.

contigua, Melania Plate 4, Figure 19
1870b, AJC **6:** 7 (Kauai). Lectotype, here selected, MCZ 74887; paralectotypes MCZ 298908; not located in ANSP by Baker (1964: 181).

contigua, Terebra
1871e, AJC **7:** 20. New name for *Terebra assimilis* Pease 1869 non Angas 1867. See under: *assimilis, Terebra.*

contigua, Trochomorpha
1871d, PZS for 1871: 457. New name for *Helix congrua* Pease 1868 non Pfeiffer 1858. See under: *congrua, Helix.*

conula, Helix Plate 3, Figure 6
1861d, PZS for 1861: 243 (Tahiti). Lectotype, here selected, MCZ 297945; paralectotypes MCZ 298469.

coreensis, Turcica Plate 10, Figure 23
1860c, PZS **28:** 189, pl. 51, fig. 2 (Corea [Korea] Sea).

Lectotype, here selected, MCZ 104609 is the figured type; not located in BMNH by Kay (1965: 85).

corrugata 'Pease' Tryon, *Borsonia*
1884, MofC (1) **6:** 228 [*nomen nudum*].

corrugata, Helicina Plate 5, Figure 4
1865a, PZS for 1864: 673 (Islands of the Central Pacific); 1871d, PZS for 1871: 476 (Raiatea). Lectotype, here selected, MCZ 297925; paralectotypes MCZ 298904.

corrugata, Trivia Plate 10, Figure 25
1868g, AJC **4:** 95, pl. 11, figs. 14, 15 (Paumotus). Lectotype, here selected, MCZ 303451; paralectotypes MCZ 303197; three specimens identified by Pease [idiotypes] ANSP 39703 labeled as from the Sandwich Islands.

corrugatus, Euchelus
1861b, PZS **28:** 435 (Sandwich Islands). Lectotype BMNH 1962821 selected by Kay (1965: 58, pl. 8, figs. 12, 13); paralectotypes MCZ 89897.

costata, Engina
1860b, PZS **28:** 142 (Sandwich Islands). Lectotype BMNH 1961163 selected by Kay (1965: 14, pl. 1, figs. 17, 18).

costata, Hydrocaena
1865b, PZS for 1864: 676 [*nomen nudum*].

costata, Leptothyra Plate 7, Figure 19
1869d, AJC **5:** 70 (Maui). Lectotype, here selected, MCZ 245261; paralectotypes MCZ 298461.

costata, Realia
1868b, AJC **3:** 225 (Tahaa); 1869a, JdeC **17:** 158, pl. 7, fig. 2 as *Scalinella.* Holotype and paratype in MNHN, *teste* Fischer-Piette (1950: 72); Baker (1964: 178) claimed the holotype is ANSP 13359a; paratypes MCZ 74939, 74951, and 187864.

costata, Vertigo Plate 2, Figure 20
1871d, PZS for 1871: 461 ([Kona] Hawaii [Island]). Listed as an undetermined species by Pilsbry and Cooke (1920: 272). Holotype MCZ 45238, *teste* Cooke on label; not MCZ 45327 which is a *Goniobasis* as mentioned by Pilsbry and Cooke (1926: 224).

costatus, Triphoris Plate 10, Figure 1
1871a, PZS for 1870: 775 (Annaa [Island]). Lectotype, here selected, MCZ 273206; paralectotypes MCZ 298481.

costellifera, Anachis
1863d, PZS for 1862: 279 (Pacific Islands). Not located in BMNH by Kay (1965: 86).

costellifera, Terebra Plate 9, Figure 19
1869d, AJC **5:** 66 ([Honolulu] Oahu). Lectotype MCZ 248800 selected by Bratcher and Cernohorsky (1987: 207, pl. 64, fig. 252b).

costellifera, Truncatella
1871d, PZS for 1871: 468 (Vavau Island [Tonga Islands]). Not located in BMNH, *teste* Mordan (personal communication). "Mr. Pease's *T. costellifera,* which Mr. Brazier obtained at Vavau, Tonga Islands is undoubtedly the same as *T. rustica* (Mousson)." (Garrett, 1887: 300).

costulata, Rissoina Plate 9, Figure 6
1868d, AJC **3:** 295, pl. 24, fig. 28 (Paumotus). Lectotype, here selected, ANSP 19241 is the figured type; three paralectotypes ANSP 391036; paralectotypes MCZ 178856.

costulosa, Atys Plate 6, Figure 5
1869d, AJC **5:** 73 ([Waimalu] Oahu). Holotype MCZ 31714, only specimen, figured by Pilsbry (1917: 218, fig. 6).

costulosa, Leptachatina
1870a, JdeC **18:** 90 (no locality); Crosse, 1876, JdeC **24:** 97, pl. 3, fig. 4 (Kauai). Holotype in MNHN, *teste* Fischer-Piette (1950: 149); paratype MCZ 45191.

costulosa, Succinea Plate 4, Figure 15
1865b, PZS for 1864: 677 (Tahitian Archipelago); 1871d, PZS for 1871: 472 (Tahiti). Lectotype, here selected, MCZ 31406; paralectotypes MCZ 298485.

costulosa, Vertigo Plate 2, Figure 22
1871d, PZS for 1871: 462 (Hawaii). Lectotype, here selected, MCZ 45244; paralectotypes MCZ 32294; not located in BMNH, *teste* Mordon (personal communication).

coxi, Bulimus ("?" *Borus*) Plate 2, Figure 12
1872b, AJC **7:** 197 (Solomon Islands). Holotype MCZ 86495, [New Hebrides Islands], *teste* Clench (1932: 69).

crassa 'Pease' Garrett, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; 1884, JANSP (2) **9:** 49 (Faahuaite [Valley], Huaheine). Lectotype ANSP 59921a selected by Baker (1963: 204); paralectotypes MCZ 25078.

crassicostata, Borsonia
1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962847 selected by Kay (1965: 17, pl. 2, figs. 5, 6).

crassilabris, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 199, 201 ([Hapai Valley] Raiatea); 1867a, AJC **3:** 81, pl. 1, fig. 6, as *crassilabrum.* Holotype ANSP 59477a, *teste* Pilsbry (1909: 226, pl. 21, fig. 10) selected as lectotype by Baker (1963: 205); paralectotypes MCZ 25131, 25139, and 25292.

crenulata, Daphnella Plate 7, Figure 3
1868c, AJC **3:** 221, pl. 15, fig. 20 ([Howland Island] Polynesia). Lectotype, here selected, ANSP 15694; paralectotype MCZ 221177.

crenulata, Scalaria
1868d, AJC **3:** 290, pl. 24, fig. 13 (Tahiti). Holotype ANSP 19553, only specimen; refigured by DuShane (1990: 3, fig. 6).

crispata, Scalaria Plate 9, Figure 13
1868d, AJC **3:** 289, pl. 24, fig. 12 (Paumotus). Lectotype ANSP 19575 selected by DuShane (1988 (5): 9, fig. [not numbered]) and refigured (1990: 8, fig. 35); two paralectotypes ANSP 352472; paralectotypes MCZ 187528.

crocata, Haminea
1861b, PZS **28:** 19, 432 (Sandwich Islands). Lectotype BMNH 1961191 selected by Kay (1965: 7, pl. 1, figs. 9, 10); paralectotypes MCZ 88127, 207387, and 297883.

curta, Daphnella Plate 7, Figure 2
1868a, AJC **3:** 221, pl. 15, fig. 22 (Paumotus). Lectotype, here selected, ANSP 16956; paralectotype MCZ 221178.

cylindracea 'Pease' Nevill, *Truncatella*
1878, *Hand List of Mollusca in the Indian Museum* 1: 253 [*nomen nudum*]. MCZ 161490.

cylindraceum, Cerithium
1869d, AJC **5:** 77 (Paumotus). Holotype ANSP 17703, *teste,* Houbrick (1992: 49, fig. 31j); paratypes MCZ 297939 (Plate 6, Figure 6) and 298468.

cylindrata, Leptachatina
1869c, JdeC **17:** 168 (Kauai). Lectotype, here selected, ANSP 57806 is the syntype figured by Cooke (1910: 18, pl. 8, figs. 63, 64); paralectotypes in MNHN, *teste* Fischer-Piette (1950: 72).

cylindrica, Clathurella
1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962765 selected by Kay (1965: 20, pl. 8, fig. 8).

cylindrica, Marginella
1863c, PZS for 1862: 244 (Kingsmill Islands); 1868d, AJC **3:** 280, pl. 23, fig. 19 [Tarawa Island] as *Marginella polita* to replace *M. cylindracea* [*sic*] non Sowerby 1846. Lectotype BMNH 1964300 selected by Kay (1965: 77, pl. 13, figs. 5, 6) is the syntype figured by Reeve (1865, *Conchologia Iconica* **15:** *Marginella,* pl. 21, fig. 108) as *Marginella peasei* replacing *polita* Pease non Carpenter 1857; paralectotypes MCZ 24965.

cylindrica, Truncatella
1865a, PZS for 1864: 676 [*nomen nudum*]. MCZ 181051.

cylindricus, Triphorus
1871a, PZS for 1870: 776 (Apaiang Island). Not located in BMNH, *teste* Way (personal communication).

cylindricus, Triton Plate 10, Figure 17
1868g, AJC **4:** 94, pl. 11, fig. 9 (Tahiti). Lectotype, here selected, MCZ 239749; paralectotypes MCZ 288003; not located in ANSP.

cytharoides 'Pease' Pace, *Columbella*
1902, *Proceedings of the Malacological Society of London* **5:** 74 [*nomen nudum*].

daedalea, Cithara [*Cythara*] Plate 6, Figure 11
1868a, AJC **3:** 218, pl. 15, fig. 13 (Paumotus); 1868h, AJC **4:** 105 as *Cythara debilis* Pease to replace *C. daedalea* 1868 non Reeve 1846. Lectotype, here selected, ANSP 15663; paralectotype ANSP 391052; paralectotypes MCZ 231920 and 231921.

debilis, Atys
1860a, PZS **28:** 20 (Sandwich Islands). Lectotype BMNH 1961197 selected by Kay (1965: 11, pl. 1, figs. 5, 6); probable paralectotypes MCZ 31713 though labeled as from Tahiti. See: Martens and Langkavel (1871, *Donum Bismarckianum*, p. 53), who also received specimens from Pease thus labeled.

debilis, Cythara
1868h, AJC **4:** 105. New name for *Cithara daedalea* Pease 1861 non Reeve 1846. See under: *daedalea, Cithara* [*Cythara*].

debilis, Marginella
1871e, AJC **7:** 22. New name for *Marginella oryza* Pease 1860 non Lamarck 1822.

debilis, Odostomia Plate 8, Figure 15
1868d, AJC **3:** 292, pl. 24, fig. 21 (Howland [Island]). Lectotype, here selected, MCZ 297933; not located in ANSP.

decussata, Cithara [*Cythara*] Plate 6, Figure 7
1868a, AJC **3:** 217, pl. 15, fig. 10 ([Anaa Island] Paumotus). Lectotype, here selected, ANSP 15651; paralectotype ANSP 391051; paralectotypes MCZ 231922 and 231923.

decussata, Scalaria Plate 9, Figure 14
1868d, AJC **3:** 289, pl. 24, fig. 10 (Hawaii [Island]). Lectotype ANSP 19585 selected by DuShane (1988 (7): 4, fig. [not numbered]) and refigured (1990: 7, fig. 30); paralectotype ANSP 391064; paralectotypes MCZ 187529 and 187530.

decussata, Turbonilla
1861b, PZS **28:** 438 (Sandwich Islands). Lectotype BMNH 1962842 selected by Kay (1965: 68, pl. 5, figs. 15, 16).

decussatula, Helix
1866b, AJC **2:** 291 (Sandwich Islands); 1871d, PZS for 1871: 474 as *Pitys* (Molokai). Specimens identified by Pease [idiotypes] from Waimea or Wahimi, Kauai MCZ 17273 and 17274; not located in ANSP by Baker (1963: 232) or elsewhere by Solem (1976: 377).

deformis, Stylifer Plate 9, Figure 15
1868d, AJC **3:** 293, pl. 24, fig. 23 (Paumotus). Lectotype, here selected, ANSP 19836 is the figured type; three paralectotypes ANSP 391040; paralectotypes MCZ 248839 and 248840.

delicata, Narica Plate 8, Figure 3
1868d, AJC **3:** 282, pl. 23, fig. 25 (Paumotus). Lectotype, here selected, ANSP 40201; paralectotypes MCZ 231415.

delicatus, Pleurobranchus
1861d, PZS for 1861: 245 (no locality); 1868e, AJC **4:** 79, pl. 9, fig. 1 (Huaheine). Possible syntype MCZ 297873 though labeled as from Tahiti; not located in BMNH by Kay (1965: 86).

dentata, Tornatellina Plate 4, Figure 9
1871d, PZS for 1871: 460 (Hawaii [Island]). Lectotype [so labeled], here selected, MCZ 28918; paralectotypes MCZ 175730.

dentifera, Vertigo
1871d, PZS for 1871: 462 (Roratonga [error for Aitutaki, Cook Islands, *teste* Garrett (1881: 401), who collected the specimens]). Lectotype, here selected, MCZ 258352 figured by Pilsbry and Cooke (1920: 329, pl. 30, fig. 14); paralectotype MCZ 48314.

depressa, Siphonaria Plate 1, Figure 5
1863d, PZS for 1862: 279 (Pacific Islands); 1868g, AJC **4:** 98, pl. 11, fig. 23 (Apaiang Island). Lectotype ANSP 22199 selected by Baker (1964: 159); not located in BMNH by Kay (1965: 86).

depressiformis, Helix Plate 3, Figure 1
1865b, PZS for 1864: 670 (Islands of the Central Pacific); 1871d, PZS for 1871: 475 (Tahiti). Lectotype, here selected, MCZ 17342; paralectotypes MCZ 297962. "Is *Trochomorpha swainsoni* (Pfeiffer), a Raiatean (Society Island) species," *teste* Pilsbry and Cooke (1922: 17).

depressiformis, Vitrina
1865b, PZS for 1864: 675 [*nomen nudum*].

deshayesii, Neritina
1868h, AJC **4:** 130. New name for *Neritina sandwichensis* Deshayes 1838 non Philippi 1843.

discoidea, Helicina Plate 5, Figure 6
1865a, PZS for 1864: 676 [*nomen nudum*]; 1868b, AJC **3:** 226 (Tahaa). Holotype ANSP 14398a (now 14398) is the measured type, *teste* Baker (1964: 161); probable paratypes MCZ 297927 though labeled as from Raiatea.

discoidea, Torinia Plate 9, Figure 24
1868g, AJC **4:** 102, pl. 12, fig. 18 (Paumotus). Lectotype, here selected, ANSP 38804; paralectotype ANSP 391039; paralectotype MCZ 297941.

dispar, Neritina Plate 8, Figure 8
1868d, AJC **3:** 285, pl. 24, fig. 3 (Roratonga). Lectotype ANSP 37714 selected by Baker (1964: 160); nine paralectotypes ANSP 358497; paralectotypes MCZ 73472.

distans, Helix
1866b, AJC **2:** 290 (Sandwich Islands). Not located in ANSP.

distorta, Leiostraca
1861b, PZS **28:** 438 (Sandwich Islands). Holotype BMNH 1962841 figured by Kay (1965: 67, pl. 11, figs. 12, 13); paratype MCZ 31706 figured by Pilsbry (1917: 229, figs. 13c, d).

dubia, Partula affinis
1865b, PZS for 1864: 675 [*nomen nudum*].

dubia 'Pease' Garrett, *Partula otaheitana*
1865b, PZS for 1864: 675 [*nomen nudum*]; 1884, JANSP (2) **9:** 49 (valley several miles from Papinoo [Tahiti]). Syntypes ANSP from Pease figured by Pilsbry (1909: 188, pl. 25, figs. 10, 11) [not in Baker, 1963]; syntypes MCZ 25315.

elegans, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Lectotype BMNH 1961166 selected by Kay (1965: 21, pl. 2, figs. 21, 22; pl. 8, fig. 6); paralectotype MCZ 50009.

elongata, Hydrocaena
1865b, PZS for 1864: 676 [*nomen nudum*].

elongata, Partula
1865b, PZS for 1864: 676 [*nomen nudum*]; 1866a, AJC **2:** 196 ([Vianae Ravine] Moorea); 1867a, AJC **3:** 81, pl. 1, fig. 2. Lectotype ANSP 59477a selected by Baker (1963: 205) is the figured type; paralectotypes MCZ 24899, 24921, 25127, and 25294.

elongata, Realia
1868b, AJC **3:** 225 (Raiatea); 1869a, JdeC **17:** 152, pl. 7, fig. 4 as *Omphalotropis.* Holotype in MNHN, *teste* Fischer-Piette (1950: 72); Baker (1964: 178), apparently unaware of this, selected as lectotype ANSP 13350a; paratypes MCZ 187861 and 187862.

elongata, Succinea Plate 4, Figure 14
1870a, JdeC **18:** 96 (Kauai). Lectotype, here selected, MCZ 161665, probable measured type.

elongata, Syphonota
1860a, PZS **28:** 24 (Sandwich Islands). Syntypes MCZ 31442 and 298486; not located in BMNH by Kay (1965: 84).

elongata, Turbonilla Plate 10, Figure 22
1868d, AJC **3:** 293, pl. 24, fig. 22 (Paumotus). Lectotype, here selected, MCZ 10537; paralectotypes MCZ 10539; not located in ANSP.

elongata, Volutella
1868d, AJC **3:** 281, pl. 23, fig. 23 (Fanning Island). Not located in ANSP.

erecta, Laminella
1869c, JdeC **17:** 174 (Maui). Holotype in MNHN figured by Fischer-Piette (1950: 73, fig. 53); paratypes MCZ 23338.

ericea, Mitra
1860b, PZS **28:** 146 (Sandwich Islands); 1869f, AJC **5:** 85 is *Mitra turgida* Reeve 1845. Lectotype BMNH 1961161 selected by Kay (1965: 28, pl. 3, figs. 3, 4); paralectotypes MCZ 260605.

exaratus, Rhizochilus
1861a, PZS **28:** 399 (Sandwich Islands); 1868h, AJC **4:** 115 is *Coralliophila deformis* Lamarck 1816. Lectotype BMNH 1961177 selected by Kay (1965: 41, pl. 4, figs. 10, 11); paralectotypes MCZ 297936.

exilis, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Lectotype BMNH 1961166 selected by Kay (1965: 21, pl. 2, figs. 21, 22; pl. 8, fig. 6); paralectotype MCZ 50009.

exilis, Drillia
1868a, AJC **3:** 220, pl. 15, fig. 19 (Tahiti). Lectotype, here selected, ANSP 15690 is the figured type; paralectotype ANSP 316068.

exilis, Eulima Plate 7, Figure 11
1863b, PZS for 1862: 242 (Pacific Islands); 1868d, AJC **3:** 294, pl. 24, fig. 25 (Paumotus). Lectotype, here selected, MCZ 187831; paralectotype MCZ 187832; not located in BMNH by Kay (1965: 86).

exilis, Trochus Plate 10, Figure 26
1868d, AJC **3:** 286, pl. 24, fig. 7 (Paumotus). Lectotype, here selected, MCZ 104617; paralectotype MCZ 303193; not located in ANSP.

expansa, Auriculella
1868f, JdeC **16:** 343, pl. 14, fig. 8 (Hawaiian Islands). Holotype in MNHN, *teste* Fischer-Piette (1950: 71); paratypes MCZ 45155.

expansa, Partula
1871f, AJC **7:** 26, pl. 9, fig. 3 (Tutuila). Holotype ANSP 59453, *teste* Baker (1963: 205).

extensa, Leptachatina
1870a, JdeC **18:** 92 (Kauai). Not mentioned by Fischer-Piette (1950: 74).

faba, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*]; 1868b, AJC **3:** 226 [*nomen nudum*] (neighboring island near Tahaa).

faba 'Pease' Garrett, *Helicina*
1884, JANSP (2) **9:** 105, pl. 3, figs. 61, 61a, b (Raiatea and Moorea). Holotype ANSP 14546a, *teste* Baker (1964: 161).

fabrefacta, Helix Plate 3, Figure 2
1865a, PZS for 1864: 669 ([Raiatea]). Lectotype, here selected, MCZ 17238; paralectotypes MCZ 176568. The neotype USNM 42427 selected by Solem (1976:

363) but not figured is considered here to be invalid since authentic types are available.

fasciata, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 202 (Marquesas Islands) is *Partula ganymedes* Pfeiffer, *teste* Pease (1866, AJC **2:** 293). Syntypes MCZ 25113 and 25324.

fasciata, Planaxis
1868g, AJC **4:** 102, pl. 12, fig. 17 (Paumotus). Holotype ANSP 18286, only specimen; specimens subsequently identified by Pease [idiotypes] MCZ 187838.

ficta, Helix
1865a, PZS for 1864: 669 (no locality, Tahaa [*teste* Garrett 1884: 38]). Lectotype USNM 24213 selected by Solem (1976: 362 [not figured]); paralectotypes MCZ 17240.

filocostata, Pitys
1871d, PZS for 1871: 454 (Kauai). Not located in BMNH, *teste* Mordan personal communication).

fimbriatus, Euchelus
1861c, PZS **28:** 435 (Sandwich Islands). Holotype BMNH 1962823 figured by Kay (1965: 58, pl. 8, figs. 14, 15); paratype MCZ 89896.

fisheri 'Pease' Paetel, *Dolabrifera*
1888, *Catalog der Conchylien-Sammlung* (Berlin) **1:** 635 [*nomen nudum*].

flammea, Rissoa Plate 9, Figure 7
1868d, AJC **3:** 297, pl. 24 [not 14], fig. 33 (Caroline [Islands]). Lectotype MCZ [not ANSP] 178868 [nor MCZ 178863 as on plate caption] selected by Ponder and de Keyzer (1992: 1058, fig. 3C) labeled as holotype; six paralectotypes MCZ 178867 [not 178861] borrowed from the MCZ in 1990 but, "not examined"; not located in ANSP.

flammulata, Mitra
1868a, AJC **3:** 212 (Sandwich [Islands] and Paumotus). Not located in ANSP.

flammulata, Triphoris
1861b, PZS **28:** 434 ([Haena, Kauai] Sandwich Islands). Lectotype BMNH 1961175 selected by Kay (1965: 52, pl. 6, figs. 15, 16); paralectotypes MCZ 50065 and 50066.

flavescens, Helicina
1868b, AJC **3:** 228, pl. 15, fig. 25 (Mangaia [Cook Islands]); 1871d, PZS for 1871: 476; here Pease admits that *Helicina flavescens* is a redescription of his *H. pacifica*. Holotype ANSP 14401a, *teste* Baker (1964: 161); paratypes MCZ 297928.

formosa, Cylindra Plate 7, Figure 1
1868d, AJC **3:** 271, pl. 23, fig. 1 (Ascension [Island]). Holotype MCZ 260605 figured by Cernohorsky (1991: 132, pl. 130, fig. 2); not located in ANSP.

formosa 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 60, pl. 3, fig. 49 (Fatimu on the southwest part of Raiatea). Holotype ANSP 59453 refigured by Pilsbry (1909: 218, pl. 20, fig. 5); paratypes MCZ 25193.

fortiplicata, Turricula (*Costellaria*) Plate 10, Figure 21
1868a, AJC **3:** 213, pl. 15, fig. 3 (Paumotus). Lectotype, here selected, ANSP 28844; paralectotype ANSP 391043; paralectotypes MCZ 260609.

foveolatus, Murex
1869e, AJC **5:** 83, pl. 8, fig. 3 (Gulf of [Golfo de] California, La Paz [Baja California Sur, Mexico]). Tryon, 1880, MofC (1) **2:** 129 as *Murex peasei* to replace *M. foveolatus* non Hinds 1844. Lectotype ANSP 36144 selected by Myers and D'Attilio (1989: 155, figs. 1, 2); two paralectotypes MCZ 304068.

fragilis, Hydrocena
1861c, PZS **28:** 439 (Ebon Island); 1869a, JdeC **17:** 145, pl. 7, fig. 6 as *Omphalotropis*. Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 297957.

fragilis, Volvatella
1860a, PZS **28:** 20 (Sandwich Islands); 1868e, AJC **4:** 73, pl. 7, fig. 4. Holotype BMNH 1962753, *teste* Kay (1965: 12 [not figured]).

fratercula, Helix
1867b, AJC **3:** 104. New name for *Helix sculptilis* Pease 1865 non Bland 1858. See under: *sculptilis, Helix*.

fratercula, Pitys
1871d, PZS for 1871: 452 [*nomen nudum*] (Hervey Islands). MCZ 176558 and 297860.

frivola, Helix
1866b, AJC **2:** 290, pl. 21, fig. 3 (Polynesia); 1871d, PZS for 1871: 475 as *Helicopsis* (Oualan [Island]). Holotype ANSP 49296a, *teste* Baker (1963: 334); paratypes MCZ 135675.

fucata, Scalaria
1861a, PZS **28:** 400 (Sandwich Islands). Lectotype BMNH 1961168 selected by Kay (1965: 43, pl. 6, figs. 11, 12); paralectotypes MCZ 187526.

fucata, Triphoris
1861b, PZS **28:** 433 ([Kauai] Sandwich Islands). Lectotype BMNH 1961171 selected by Kay (1965: 51, pl. 6, figs. 13, 14); paralectotypes MCZ 50067 and 73736.

fucatum, Cerithium
1861b, PZS **28:** 432 (Sandwich Islands). Lectotype BMNH 1962800 selected by Kay (1965: 46, pl. 5, figs. 7, 8).

fusca, Dolabifera
1868e, AJC **4:** 76, pl. 8, fig. 4 ([Tahiti] Polynesia). Syntype MCZ 297870.

fusca, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 193 (Raiatea). Syntypes MCZ 25363; not located in ANSP by Baker (1965: 205).

fusca, Vitrina
1868j, AJC **4:** 155, pl. 12, fig. 6 (Marquesas [Islands]). Holotype ANSP 49270a, *teste* Baker (1963: 234).

fuscata, Helix
1865a, PZS for 1864: 675 [*nomen nudum*].

fuscata 'Pease' Pilsbry, *Trochomorpha*
1896, *Nautilus* **9:** 120 (Ponape, Caroline Islands). Holotype ANSP 1934, *teste* Baker (1963: 238).

fuscescens, Strigatella
1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1961184 selected by Kay (1965: 29, pl. 3, figs. 7, 8).

fuscolineata, Neptunea
1860c, PZS **28:** 189 (Corea [Korea] Sea). Holotype BMNH 1964277, *teste* Kay (1965: 35, pl. 12, figs. 14, 15).

fuscomaculata, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Lectotype BMNH 1961153 selected by Kay (1965: 23, pl. 2, figs. 7, 8).

fuscomaculata, Cypraea
1865d, PZS for 1865: 515 (Islands of the Central Pacific); 1868g, AJC **4:** 95, pl. 11, figs. 10, 11 (Apaian Island [Garrett, 1879: 113, stated that he collected the types from the outer reefs of the Kingsmill Islands]). Lectotype BMNH 1964316 selected by Kay (1965: 83, pl. 14, figs. 1, 2).

fusconigra, Vexilla
1860b, PZS **28:** 141 (Sandwich Islands); 1868h, AJC **4:** 115. Lectotype BMNH 1961164 selected by Kay (1965: 13, pl. 4, figs. 3, 4).

fuscus 'Philippi' Pease, *Melampus*
1865a, PZS for 1864: 676 [*nomen nudum*].

fusiformis, Columbella
1868h, AJC **4:** 122. New name for *Columbella pusilla* Pease 1862 non Sowerby 1844. See under: *pusilla, Columbella*.

fusiformis, Conus
1861a, PZS **28:** 398 (Sandwich Islands); 1868h, AJC **4:** 126 non Fischer 1807. Changed to: *Conus parvus*. Lectotype BMNH 1962788 selected by Kay (1965: 38, pl. 10, fig. 12); paralectotypes MCZ 197346 and 197347.

fusiformis, Engina
1865d, PZS for 1865: 513 (Islands of the Central Pacific); 1868d, AJC **3:** 273, pl. 23, fig. 5 (Howland Island). Lectotype BMNH 1964309 selected by Kay (1965: 81, pl. 13, figs. 15, 16); paralectotypes MCZ 297954.

fusiformis, Mitropsis
1868a, AJC **3:** 212, pl. 15, fig. 2 (Paumotus). Lectotype, here selected, ANSP 28756 is the figured type.

galba, Haminea
1861b, PZS **28:** 432 (Sandwich Islands). Lectotype BMNH 1961194 selected by Kay (1965: 8, pl. 1, figs. 11, 12).

garrettii, Cythara
1860b, PZS **28:** 147 (Sandwich Islands); 1868h, AJC **4:** 105. Lectotype BMNH 1962780 selected by Kay (1965: 32, pl. 10, fig. 11); paralectotypes MCZ 49999 and 298242.

garrettii, Fossar
1868h, AJC **4:** 128. New name for *Adeorbis costata* Garrett 1857 non Philippi 1844.

garrettii, Murex
1868h, AJC **4:** 103. New name for *Murex exiguus* Garrett 1857 non Broderip 1832.

garrettii, Partula
1865a, PZS for 1864: 672 (Islands of the Central Pacific [Vaioara on the west coast of Raiatea, *teste* Garrett, 1884: 56]). Syntype ANSP figured by Pilsbry (1909: 228, pl. 21, fig. 15), but not located by Baker (1963); syntypes MCZ 24894 and 25306.

gibbus, Latirus Plate 7, Figure 16
1865c, PZS for 1865: 54 (Pacific Islands); 1868d, AJC **3:** 279, pl. 23, fig. 17 (Howland Island). Lectotype, here selected, MCZ 261182; paralectotype MCZ 303192; not located in BMNH by Kay (1965: 86) or in ANSP.

glabra, Mitra
1868d, AJC **3:** 272, pl. 23, fig. 2 (Ascension [Island]); 1869f, AJC **5:** 85 is *Mitra lubrica* Pease 1869, new name for *M. glabra* Pease 1868 non Swainson 1821 non Risso 1826. Lectotype, here selected, ANSP 28854 is the figured type.

globosa 'Pease' Pilsbry, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; 1909, MofC (2)**20:** 224. Manuscript name listed under the synonymy of *Partula heba* (Pfeiffer) (south end of Raiatea, Garrett *ms*); MCZ 25275.

gracile, Cerithium
1861b, PZS **28:** 432 (Sandwich Islands). Lectotype BMNH 1961173 selected by Kay (1965: 45, pl. 5, figs. 5, 6).

gracilior 'Pease' Hartman, *Partula*
1881, BMCZ **9:** 183 ([Moorea]). Syntype MCZ 25059.

gracilis, Blauneria
1860b, PZS **28:** 145 (Sandwich Islands). Lectotype BMNH 1962770 selected by Kay (1965: 26, pl. 9, fig. 3); paralectotypes MCZ 297790.

gracilis, Citharopsis Plate 6, Figure 13
1868g, AJC **4:** 97, pl. 11, fig. 20 (Paumotus). Lectotype, here selected, ANSP 16921.

gracilis, Mucronalia Plate 7, Figure 24
1868d, AJC **3:** 295, pl. 24, fig. 27 (Tahiti). Lectotype MCZ 288506 selected by Warén (1980: 294, fig. 100); paralectotypes MCZ 248841 and ANSP 391065.

gracilis, Nassa Plate 8, Figure 5
1868d, AJC **3:** 273, pl. 23, fig. 4 (Ascension [Island]). Lectotype, here selected, MCZ 228822; "Appears to be lost," Cernohorsky (1984: 66).

gracilis, Odostomia
1868d, AJC **3:** 292, pl. 24, fig. 20 (Hawaii [Island]). Lectotype ANSP 19967 selected by Pilsbry (1917: 321, fig. 18); paralectotypes MCZ 10489.

gracilis, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 197 (Tahitian Archipelago [upper portions of all the central valleys on both the east and west sides of Raiatea. It is more abundant in Tolo and Hapai Valleys than elsewhere. It occurs more rarely at Tahiti, *teste* Garrett, 1884: 70]); 1867a AJC **3:** 81, pl. 1, fig. 3. Not located in ANSP by Baker (1963: 205); syntypes MCZ 24905 and 25115 *both* from Raiatea.

gracilis, Rissoa Plate 9, Figure 3
1861b, PZS **28:** 438 ([Kauai] Sandwich Islands); 1862b, JdeC **10:** 382 as *Rissoina*. Lectotype, here selected, MCZ 178853; paralectotype MCZ 298460; not located in BMNH by Kay (1965: 86) or in MNHN by Fischer-Piette (1950: 20).

gracilis, Tornatellina Plate 4, Figure 10
1871d, PZS for 1871: 460 (Kauai). Lectotype, here selected, MCZ 302554.

gracilis, Triphoris Plate 10, Figure 10
1871a, PZS for 1870: 774 (Kauai). Lectotype, here selected, MCZ 50058; paralectotype MCZ 298493.

gracilis, Triphoris
1871a, PZS for 1870: 777 (Kauai). The description of this and the preceding *Triphoris gracilis* differ but slightly and though it appears that Pease described the same shells under the same name, Tryon (1872, AJC **7:** 206) renamed the second *gracilis, T. peasei.*

grandis, Syphonota
1860a, PZS **28:** 23 (Sandwich Islands). Syntype MCZ 297866 [of questionable diagnostic value]; not located in BMNH by Kay (1965: 84).

granifera, Fissurella
1861d, PZS for 1861: 244 (Sandwich Islands). Lectotype BMNH 1964278 selected by Kay (1965: 70, pl. 12, figs. 3, 4); paralectotypes MCZ 150701.

granifera, Narica Plate 8, Figure 2
1869d, AJC **5:** 78, pl. 8, fig. 13 (Jarvis [Island]). Lectotype, here selected, ANSP 37301; two paralectotypes ANSP 391041; paralectotypes MCZ 231414.

graniferus, Vertagus
1861b, PZS **28:** 433 (Sandwich Islands). Holotype BMNH 1961208, *teste* Kay (1965: 49, pl. 5, figs. 9, 10).

granocostata, Scutellina Plate 5, Figure 1
1868g, AJC **4:** 100 (Hawaii [Island]). Lectotype, here selected, MCZ 83723 labeled as holotype.

granosus, Triphoris Plate 10, Figure 9
1871a, PZS for 1870: 776 (Tahiti). Lectotype, here selected, MCZ 273207; paralectotypes MCZ 288954.

granulata, Cypraea
1863d, PZS for 1862: 278 (Pacific Islands). Lectotype BMNH 1964306 selected by Kay (1965: 79, pl. 14, figs. 17, 18); paralectotypes MCZ 297955 from Annaa Island, Tuamotu Archipelago.

granulosa, Collonia Plate 6, Figure 20
1868g, AJC **4:** 92, pl. 11, fig. 4 (Ponape). Lectotype, here selected, MCZ 245264; paralectotypes MCZ 297961; not located in ANSP.

granulosa, Rissoina
1862b, JdeC **10:** 382, pl. 13, fig. 10 (Sandwich [Islands]). Holotype and paratype in MNHN, *teste* Fischer-Piette (1950: 20); paratype MCZ 178862.

granulosus, Latirus Plate 7, Figure 17
1868d, AJC **3:** 279, pl. 23, fig. 10 [fig. 18 in error] (Paumotus). Lectotype MCZ 261181 selected by Cernohorsky (1987: 97, fig. 5) is the figured type; paralectotypes MCZ 297961.

guppyi, Helicina
1871d, PZS for 1871: 467. New name for *Helicina humilis* Guppy 1868 non Rousseau 1854.

harpa, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Lectotype BMNH 1961206 selected by Kay (1965: 22, pl. 2, figs. 23, 24).

hawaiiensis, Perna
1871f, AJC **7:** 25. Invalid new name for *Perna californica* Conrad 1834. Changed because *californica* was a misnomer.

hutchinsonii, Helicter Plate 4, Figure 2
1862a, PZS for 1862: 7 (Maui). Lectotype, here selected, MCZ 45254; paralectotype MCZ 141500.

ignominiosus 'Pease' Paetel, *Achatinella*
1873, *Catalog der Conchylien-Sammlung* (Berlin), p. 105 [*nomem nudum*].

imbricata, Vanikoro
1861b, PZS **28:** 435 (Sandwich Islands). Holotype BMNH 1962820, *teste* Kay (1965: 57, pl. 8, fig. 11).

imperforata 'Pease' Garrett, *Partula*
1884d, JANSP (2) **9:** 54, pl. 3, fig. 53 (Toloa and Hapai Valleys, west coast of Raiatea [Island], Society Islands). Holotype ANSP 59502a, *teste* Baker (1963: 205); holotype and two paratypes figured by Pilsbry (1909: 221, pl. 20, figs. 13–15); paratypes MCZ 25262 from Hapai Valley.

imperforata, Pithys
1870c, JdeC **18:** 394 (Aitutake [Island, Cook Islands]); 1871, PZS for 1871: 453. Lectotype BPBM 2322 selected by Solem (1976: 170, figs. 76e, f); paralectotypes MCZ 17279.

impressa 'Pease' Paetel, *Achatinella*
1873, *Catalog der Conchylien-Sammlung* (Berlin), p. 105 [*nomen nudum*].

incisa, Triphoris
1861b, PZS **28:** 434 ([Haena Point, Kauai] Sandwich Islands). Lectotype BMNH 1961151 selected by Kay (1965: 54, pl. 6, figs. 19, 20); paralectotypes MCZ 50061 and 73738.

"?" *inconspicua, Helicina*
1865b, PZS for 1864: 676 [*nomen nudum*].

inflexa, Eulima Plate 7, Figure 9
1868d, AJC **3:** 294, pl. 24, fig. 26 (Paumotus). Lectotype, here selected, ANSP 59334 is the figured type; five paralectotypes ANSP 391056; paralectotypes MCZ 31703 and 31704.

inflexa, Terebra swainsonii
1869d, AJC **5:** 64. Based on specimen figured by Reeve, 1860, *Conchologia Iconica* **12,** *Terebra,* pl. 22, fig. 118. Holotype BMNH 1979113 is the figured type.

interlirata, Neritopsis Plate 8, Figure 9
1868d, AJC **3:** 282, pl. 23, fig. 26 (Annaa Island). Lectotype, here selected, MCZ 73479; not located in ANSP.

intermedius, Triton Plate 10, Figure 16
1869d, AJC **5:** 74 (Oahu). Lectotype MCZ 191331 selected by Clench and Turner (1957: 217, pl. 122, fig. 2); paralectotypes MCZ 191330.

interrupta, Daphnella
1860b, PZS **28:** 147 (Sandwich Islands). Lectotype BMNH 1962849 selected by Kay (1965: 34, pl. 5, fig. 13); paralectotypes MCZ 50011.

kauaiensis, Melania
1870b, AJC **6:** 7, pl. 3, fig. 6 (Kauai). Holotype ANSP 26510, *teste* Baker (1964: 190); paratypes MCZ 74929.

labiata 'Pease' Pilsbry, *Partula*
1909, MofC (2) **20:** 217, pl. 20, fig. 9 ([Vairahi Valley, Raiatea]). Holotype ANSP 59460, *teste* Baker (1963: 205); paratype MCZ 24882.

labiata 'Pease' Schmeltz, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; 1874, *Museum Godeffroy* (Hamburg). Catalog **5:** 207 [*nomen nudum*].

labiata, Succinea Plate 4, Figure 16
1865a, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 227 (Raiatea). Lectotype, here selected, MCZ 298909; paralectotypes MCZ 31409; not located in ANSP by Baker (1963: 215).

laevis, Gena Plate 6, Figure 2
1868d, AJC **3:** 283, pl. 23, figs. 7, 28, 29 (Tahiti). Lectotype, here selected, ANSP 40754; paralectotypes MCZ 297919.

laevis, Lamellina Plate 2, Figure 16
1865a, PZS for 1864: 672 (Islands of the Central Pacific); 1871, PZS for 1871: 473 (Tahiti). Lectotype, here selected, MCZ 154942 labeled "Hervey Islands"; syntype ANSP figured by Pilsbry (1915: 165, pl. 33, fig. 6), but not located in ANSP by Baker (1963).

laevis, Leptachatina
1870a, JdeC **18:** 91 (Kauai); Crosse, 1876, JdeC **24:** 97, pl. 4, fig. 6. Holotype in MNHN, *teste* Fischer-Piette (1950: 149); paratypes MCZ 45173.

laevis, Realia
1865e, AJC **1:** 289 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 5 (Oualan Island); Pease, 1869a, JdeC **17:** 145 as *Omphalotropis* (Ponape [or] Ascension [Island]). Holotype ANSP 12225a, *teste* Baker (1964: 178); paratypes MCZ 187921, 187922, and 187923.

laminata, Helix Plate 3, Figure 4
1866b, AJC **2:** 292 (Sandwich Islands); 1871d, PZS for 1871: 474 as *Endodonta* (Kauai). Lectotype, here selected, MCZ 17233; paralectotypes MCZ 298477 and BPBM, *teste* MCZ label; not located in ANSP by Baker (1963: 232) or elsewhere by Solem (1976: 377).

lateritia 'A. Adams' Pease, *Assiminea*
1869b, JdeC **17:** 164 [*nomen nudum*]. Error for *Assiminea latericea* H. and A. Adams 1864.

lauta, Bullina
1860a, PZS **28:** 19 (Sandwich Islands). Holotype BMNH 1961201, *teste* Kay (1965: 6, pl. 1, figs. 3, 4).

lauta, Drillia Plate 7, Figure 8
1868a, AJC **3:** 220, pl. 15, fig. 18 ([Anaa Island] Paumotus). Lectotype, here selected, ANSP 15692 is the figured type; paralectotypes MCZ 49981.

lauta, Terebra Plate 9, Figure 21
1869d, AJC **5:** 66 (Oahu). Holotype ANSP 33589 figured by Tryon (1885: 33, pl. 10, fig. 91), *teste* Cernohorsky and Bratcher (1976: 139).

lenta, Helix
1865a, PZS for 1864: 675 [*nomen nudum*].

lenticulina, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*].

liberatus, Capulus
1868d, AJC **3:** 285, pl. 24, fig. 2 (Paumotus). Not located in ANSP.

lignaria, Partula
1865b, PZS for 1864: 671 (Islands of the Central Pacific [valley about two miles west of Fautaua [Tahiti], *teste* Garrett, 1884: 48]). Syntypes MCZ 25136, 25142, and 25058.

lineata, Alcyna Plate 6, Figure 4
1869d, AJC **5:** 69 ([Puuloa] Oahu). Holotype MCZ 31724 figured by Pilsbry (1917: 212, pl. 15, fig. 4).

lineata, Columbella
1861a, PZS **28:** 399 (Sandwich Islands). Not located in BMNH by Kay (1965: 85).

lineolata, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 224 (Tahiti). Holotype ANSP 59933a, *teste* Baker (1963: 205); paratypes MCZ 24933.

lirata, Pleurotoma
1869d, AJC **5:** 68 (Oahu). Not located in ANSP.

liratus, Latirus Plate 7, Figure 15
1868i, AJC **4:** 152, figured by Reeve, 1847, *Conchologia Iconica* **4:** *Turbinella*, pl. 12, figs. 61a, b (Marquesas [Islands]). Lectotype, here selected, MCZ 302628; paralectotypes MCZ 297938; possible paralectotypes BMNH 1979031; location of figured type unknown.

lubrica, Mitra
1869f, AJC **5:** 85. New name for *Mitra glabra* Pease 1868 non Swainson 1821 non Risso 1826. See under: *glabra, Mitra*.

lucida, Assiminea
1869f, JdeC **17:** 166, pl. 7, fig. 10 (Annaa Island). Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74952.

lucida, Leptachatina
1869g, PZS for 1869: 650 [*nomen nudum*]; 1870a, JdeC **18:** 93 (Kauai). Not mentioned by Fischer-Piette (1950: 74).

lucidus, Melampus Plate 4, Figure 22
1869d, AJC **5:** 75 ([Honolulu] Oahu). Lectotype ANSP 22284 selected by Baker (1964: 151); paralectotype ANSP 391058; paralectotypes MCZ 297789.

lugubris, Partula "var.?"
1865a, PZS for 1864: 672 (Islands of the Central Pacific [Hapai Valley, Raiatea, *teste* Garrett, 1884: 77]); 1871d, PZS for 1871: 473. Syntypes MCZ 3641 and 25288.

lutea, Borsonia
1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962756 selected by Kay (1965: 17, pl. 2, figs. 15, 16); paralectotypes MCZ 49978.

luteostoma, Ranella
1861a, PZS **28:** 397 (Sandwich Islands). Not located in BMNH by Kay (1965: 85).

maculata, Engina lineata
1869d, AJC **5:** 76, pl. 8, fig. 12 (Apaian). Lectotype, here selected, ANSP 34538 is the figured type.

maculata, Nerita Plate 8, Figure 7
1868d, AJC **3:** 286, pl. 24, fig. 6 (Tahiti). Lectotype, here selected, ANSP 37490; nine paralectotypes ANSP 391034.

maculatus, Triphoris Plate 10, Figure 13
1871a, PZS for 1870: 777 (Kauai). Lectotype, here selected, MCZ 50069; paralectotype MCZ 298494.

maculosa, Clathurella Plate 6, Figure 14
1863b, PZS for 1862: 242 (Pacific Islands); 1868a, AJC **3:** 219, pl. 15, fig. 16 (Paumotus). Lectotype, here selected, ANSP 48693; not located in BMNH by Kay (1965: 86).

maculosa, Columbella
1871e, AJC **7:** 22. New name for *Columbella dermestoides* Angas 1867 non Sowerby 1844.

maculosa, Daphnella
1860b, PZS **28:** 148 (Sandwich Islands). Not located in BMNH by Kay (1965: 85).

maculosus Euchelus
1863c, PZS for 1862: 243 (Pacific Islands); 1868g, AJC **4:** 91, pl. 11, fig. 1 as *Collonia maculosa* ([Anaa Island] Paumotus). Lectotype BMNH 1964298 selected by Kay (1965: 77, pl. 13, figs. 1, 2); figured paralectotype ANSP 38414; paralectotypes MCZ 89828.

mammillata, Succinea Plate 4, Figure 12
1871b, PZS for 1871: 459 (Nukahiva). Lectotype, here selected, MCZ 155145; paralectotype MCZ 298906; not located in BMNH, *teste* Mordan (personal communication).

marginatus, Pleurobranchus
1860a, PZS **28:** 25 (Sandwich Islands). Not located in BMNH by Kay (1965: 84).

marmorata, Purpura Plate 8, Figure 19
1865d, PZS for 1865: 515 (Islands of the Central Pacific); 1868g, AJC **4:** 92, pl. 11, fig. 5 (Apaian Island). Lectotype, here selected, MCZ 177824; paralectotypes MCZ 302627; not located in BMNH by Kay (1965: 86).

marmorata 'Pease' Martens and
Langkavel, *Triforis* [*sic*] Plate 10, Figure 5
1871, *Donum Bismarckianum*, p. 38, pl. 2, fig. 7 ([Kauai] Sandwich Islands). Lectotype, here selected, MCZ 50055; paralectotypes MCZ 298492.

marmorea, Bulla
1861b, PZS **28:** 431 (Sandwich Islands). Holotype BMNH 1961209 figured by Kay (1965: 44, pl. 1, figs. 13, 14); paratypes MCZ 297878.

marmorea 'Pease' Paetel, *Dolabrifera*
1888, *Catalog der Conchylien-Sammlung* (Berlin) **1:** 635 [*nomen nudum*].

marmorea, Margarita
1861b, PZS **28:** 435 (Sandwich Islands). Lectotype BMNH 1962824 selected by Kay (1965: 59, pl. 9, fig. 5).

marmoreus, Trochus Plate 9, Figure 25
1868b, AJC **3:** 287, pl. 24, fig. 9 (Paumotus). Lectotype, here selected, ANSP 40614; paralectotype ANSP 391032; paralectotype MCZ 89894.

marquesana, Helix Plate 3, Figure 5
1868j, AJC **4:** 153, pl. 12, fig. 2 (Marquesas [Islands]). Lectotype, here selected, MCZ 302557; paralectotypes MCZ 297937; not located in ANSP by Baker (1963).

megastoma 'Pease' Pilsbry, *Partula*
1909, MofC (2) **20:** 214, pl. 20, fig. 5 ([Raiatea: restricted to the higher portion of Haamoa Valley]). Holotype ANSP 5945a, *teste* Baker (1963: 205); paratype MCZ 25019.

megastoma 'Pease' Schmeltz, *Partula*
1865b, PZS for 1864: 675 [*nomen nudum*]; 1874, *Museum Godeffroy* (Hamburg). Catalog **5:** 92 [*nomen nudum*].

micans 'Pease' Tryon, *Columbella* Plate 6, Figure 19
1883, MofC (1) **5:** 124, pl. 48, fig. 85 (Paumotus; Viti Isles). Lectotype, here selected, MCZ 304063 from the Paumotus.

microstoma, Nassa
1860b, PZS **28:** 145 (Sandwich Islands). Holotype BMNH 1961458 figured by Kay (1965: 24, pl. 3, figs. 5, 6); paratype MCZ 25341.

microstoma 'Pease' Hartman, *Partula*
1881, BMCZ **9:** 184 ([Vairahi Valley] Raiatea). Syntype ANSP figured by Pilsbry (1909: 233, pl. 27, fig. 14); not located in ANSP by Baker (1963: 205); syntypes MCZ 25341.

millecostata, Scalaria
1861a, PZS **28:** 400 (Sandwich Islands). Holotype BMNH 1961170, *teste* Kay (1965: 42, pl. 6, figs. 5, 6).

minimus, Triphoris Plate 10, Figure 7
1871a, PZS for 1870: 774 (Howland Island; [Haena] Kauai). Lectotype, here selected, MCZ 50071; paralectotypes MCZ 50070 and 298495 *all* from Kauai.

modesta, Turricula Plate 10, Figure 20
1868a, AJC **3:** 212, pl. 15, fig. 6 ([Ponape] Polynesia). Lectotype, here selected, ANSP 28780; paralectotypes MCZ 260607.

monilifera, Engina
1860b, PZS **28:** 142 (Sandwich Islands). Lectotype BMNH 1961460 selected by Kay (1965: 15, pl. 2, figs. 13, 14).

monilifera, Pleurotoma
1869d, AJC **5:** 68 (Oahu). Not located in ANSP.

monilifera, Turris
1861a, PZS **28:** 398 (Sandwich Islands). Holotype BMNH 1961196, *teste* Kay (1965: 39, pl. 5, figs. 17, 18; pl. 8, fig. 7).

moussoni, Omphalotropis
1869a, JdeC **17:** 147. New name for *Omphalotropis ovata* Mousson 1865 non Pease 1861.

"?" multicolor, Helicina
1865b, PZS for 1864: 676 [*nomen nudum*].

multicostatus, Fossar
1861a, PZS **28:** 398 (Sandwich Islands). Lectotype BMNH 1962790 selected by Kay (1965: 38, pl. 6, figs. 1, 2).

multiplicata, Mitroidea
1865d, PZS for 1865: 514 (Islands of the Central Pacific). Not located in BMNH by Kay (1965: 86) or elsewhere by Cernohorsky (1976: 471).

multistriata 'Pease' Sowerby, *Collonia*
1886, *Thesaurus Conchyliorum* **5:** 212 [*nomen nudum*].

multistriatus 'Pease' Paetel *Turbo*
1888, *Catalog der Conchylien-Sammlung* (Berlin) **1:** 537 [*nomen nudum*].

nebulosa, Borsonia
1860b, PZS **28:** 143 (Sandwich Islands). Not located in BMNH by Kay (1965: 85).

nebulosa, Omphalotropis Plate 4, Figure 4
1872b, AJC **7:** 197 ([Makela = San Cristobal Island] Solomon Islands). Lectotype, here selected, MCZ 72347 labeled as holotype; paralectotype MCZ 72348.

neglecta Neritina
1861b, PZS **28:** 435 (Sandwich Islands). Lectotype BMNH 1961186 selected by Kay (1965: 56, pl. 4, figs. 5, 6).

neglectus, Conus
1861a, PZS **28:** 398 (Sandwich Islands); 1871b, JdeC **19:** 99 is a variety of *Conus flavidus* Lamarck; not located in BMNH by Kay (1965: 85).

newcombii 'Pease' Brot, *Melania*
1872, *Matériaux . . . des Mélaniens* **III:** 43 [*nomen nudum*]. Listed as a synonym of *M. kauaiensis* Pease, non *newcombii* Lea 1866.

newcombii, Mitra
1869d, AJC **5:** 69 (Oahu). Not located in ANSP.

nigra, Philinopsis
1860a, PZS **28:** 22 (Sandwich Islands). Not located in BMNH by Kay (1965: 84).

nigricans, Mitra
1865d, PZS for 1865: 514 (Islands of the Central Pacific [Marquesas Islands]). Holotype BMNH 1964312 figured by Kay (1965: 82, pl. 14, figs. 11, 12); paratypes MCZ 260604.

nigritella, Helix
1865b, PZS for 1864: 675 [*nomen nudum*].

nigropunctata, Haminea
1868e, AJC **4:** 71, pl. 7, fig. 1 (Raiatea). Probable syntypes MCZ 297876 though labeled from Tahiti.

nitens, Vertigo Plate 2, Figure 21
1861b, PZS **28:** 439 (Ebon Island). Lectotype, here selected, MCZ 151650; paralectotypes MCZ 298456.

nitida, Hydrocena
1865b, PZS for 1864: 674 (Islands of the Central Pacific); 1869b, JdeC **17:** 165, pl. 7, fig. 11 as *Assiminea* (Huaheine). Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 139120.

nitida, Tornatellina Plate 4, Figure 7
1861c, PZS **28:** 439 (Ebon Island). Lectotype, here selected, MCZ 28921; paralectotypes MCZ 28922 and 302556.

nitidula, Mucronalia
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype BMNH 1962835 selected by Kay (1965: 65, pl. 11, fig. 3); paralectotype MCZ 31711 figured by Pilsbry (1917: 226, fig. 12c); paralectotype MCZ 248842.

nodicostata, Engina Plate 7, Figure 25
1868d, AJC **3:** 274, pl. 23, fig. 8 (Paumotus). Lectotype, here selected, MCZ 260614; paralectotype MCZ 260617; "type" ANSP 34543 with the note, "matches the description but not the figure."

nodifera, Drillia
1860b, PZS **28:** 145 ([Haena, Hawaii] Sandwich Islands). Lectotype BMNH 1961210 selected by Kay (1965: 24, pl. 5, figs. 1, 2); paralectotype MCZ 49982.

nodulosa, Drillia
1863d, PZS for 1862: 279 ([Sandwich Islands]). Holotype BMNH 1964308 selected by Kay (1965: 80, pl. 14, figs. 9, 10); paratypes MCZ 49987.

nodulosa, Engina
1869d, AJC **5:** 71, pl. 8, fig. 11 (Ebon Island). Lectotype, here selected, ANSP 34513 is the figured type.

nodulosa, Turricula (*Pusia*) Plate 10, Figure 24
1868a, AJC **3:** 214, pl. 15, fig. 5 (Paumotus). Lectotype, here selected, ANSP 28713; four paralectotypes ANSP 391045; paralectotypes MCZ 260611.

normalis, Helix Plate 3, Figure 9
1865a, PZS for 1864: 669 (Islands of the Central Pacific); 1871d, PZS for 1871: 475 (Moorea). Lectotype, here selected, MCZ 11543; paralectotypes MCZ 11544.

nucea, Nassa
1869d, AJC **7:** 70, pl. 8, fig. 7 (Caroline Islands). Not located in ANSP.

nucleola, Doris
1860a, PZS **28:** 29 (Sandwich Islands). Redescription and taxonomic reappraisal by Brodie and Willan (1993: 124–133).

nucleola 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 72 ([Moorea]). Lectotype ANSP 59531a selected by Baker (1963: 205); paralectotypes MCZ 24897, 24937, and 50854.

oahuensis 'Pease' Brot, *Melania*
1872, *Matériaux . . . des Mélaniens* **III:** 43, pl. 3, fig. 2 (Oahu). Type should be in Musée d'Histoire Naturelle de Genève [not confirmed].

obconica, Helix
1865a, PZS for 1864: 669 (Islands of the Central Pacific [Raiatea, *teste* Garrett, 1884: 22, pl. 3, figs. 37, 37a, b]); figured specimen was not located in ANSP by Baker (1964). Two syntypes ANSP 49337 from Pease; not located in BMNH, *teste* Mordan, personal communication.

obesa, Partula
1868b, AJC **3:** 223, pl. 15, fig. 12 (Polynesia). Holotype, only specimen, not located in ANSP by Baker (1963: 205).

obliqua, Nassa Plate 8, Figure 6
1865d, PZS for 1865: 513 (Islands of the Central Pacific). Lectotype, here selected, MCZ 228823 labeled as probable measured holotype by Kay; not located in BMNH by Kay (1965: 86) or elsewhere by Cernohorsky (1984: 76).

oblonga, Tornatellina Plate 4, Figure 6
1865b, PZS for 1864: 673 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahiti). Lectotype, here selected, MCZ 154941; paralectotypes MCZ 297947.

oblonga, Tugalia
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype BMNH 1962831 selected by Kay (1965: 64, pl. 11, figs. 4, 5); paralectotypes MCZ 298471.

oceanica, Helicina Plate 5, Figure 9
1868b, AJC **3:** 226 (Kingsmill [Islands]). Lectotype, here selected, MCZ 176561; paralectotypes MCZ 298458; not located in ANSP by Baker (1964: 162).

ochrostoma, Realia
1865e, AJC **1:** 287 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 1 (Hervey Isles); Pease, 1869a, JdeC **17:** 147 as *Omphalotropis.* Holotype ANSP 13322a, *teste* Baker (1964: 178); paratypes MCZ 176573, 187848, and 187849.

olivacea, Carelia Plate 2, Figure 14
1866b, AJC **2:** 293 (Sandwich Islands); 1871d, PZS for 1871: 473 (Kauai). Holotype MCZ 57114, only specimen, *teste* Pease (1870c: **18:** 402); two specimens subsequently identified by Pease [idiotypes] MCZ 23343 figured by Pilsbry and Cooke (1914: 16, pl. 9, figs. 11, 15).

olivacea, Dolabrifera
1860a, PZS **28:** 22 (Sandwich Islands). Holotype BMNH 1964376, *teste* Kay (1965: 13 [not figured]).

oppressa, Trochomorpha nigritella Plate 2, Figure 6
1870c, JdeC **18:** 400 (Ponape); 1871d, PZS for 1871: 457. Lectotype, here selected, MCZ 12187; paralectotypes MCZ 12181 and 298478.

ordinata 'Pease' Paetel, *Mitra*
1887, *Catalog der Conchylien-Sammlung* (Berlin) **1:** 184 [*nomen nudum*].

ornata, Citharopsis Plate 6, Figure 12
1868g, AJC **4:** 97, pl. 11, fig. 19 (Tahiti). Lectotype, here selected, ANSP 16919; paralectotype ANSP 391046; paralectotypes MCZ 49994.

oryza, Marginella
1860b, PZS **28:** 147 (Sandwich Islands); 1871e, AJC **7:** 22 non Lamarck 1822. Changed to: *Marginella debilis;* not located in BMNH by Kay (1965: 85).

oryza, Triphoris Plate 10, Figure 11
1871a, PZS for 1870: 776 (Kauai). Lectotype, here selected, MCZ 50072.

oualanensis, Helix Plate 3, Figure 8
1866b, AJC **2:** 289, pl. 21, fig. 1 (Oualan [Island]). Lectotype, here selected, ANSP 47763; four paralectotypes ANSP 391059.

oualanensis 'Pease' Tryon, *Melania* Plate 4, Figure 20
1866b, AJC **2:** 299, pl. 20, fig. 4 (Oualan [Island]). Lectotype ANSP 26274 selected by Baker (1964: 191); paralectotypes MCZ 89614.

ovalis, Haminea Plate 4, Figure 23
1868e, AJC **4:** 71, pl. 7, fig. 2 (Tahiti). Lectotype, here selected, MCZ 297877; paralectotypes MCZ 303195.

ovalis, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 194 (Raiatea). Holotype ANSP 59448a, *teste* Baker (1963: 205) figured by Pilsbry (1909: 172, pl. 19, fig. 7); paratypes MCZ 25007.

ovata, Engina Plate 7, Figure 4
1865d, PZS for 1865: 513 (Islands of the Central Pacific); 1868d, AJC **3:** 274, pl. 23, fig. 6 (Howland Island). Lectotype, here selected, ANSP 34536 is the figured type; paralectotypes MCZ 260598 and 260599; not located in BMNH by Kay (1965: 86).

ovata, Hydrocena
1865a, PZS for 1864: 674 (Mangiers [error for Mangaia, Cook Islands]); 1869a, JdeC **17:** 148 as *Omphalotropis.* Not located in BMNH, *teste* Mordan (personal communication) or mentioned as in MNHN by Fischer-Piette (1950: 72).

ovata, Mucronalia
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype BMNH 1962810 selected by Kay (1965: 65, pl. 11, fig. 2).

ovata, Succinea
1865a, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 227 "is *Succinea papillata* Pfeiffer."

pachystoma, Labiella
1869b, JdeC **17:** 171 (Kauai). Measured holotype in MNHN, *teste* Fischer-Piette (1950: 73, fig. 52); paratypes MCZ 45181.

pacifica, Helicina Plate 2, Figure 3
1865e, AJC **1:** 291 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 7 (Oualan Island). Lectotype ANSP 14443 selected by Baker (1964: 162); paralectotype ANSP 358505. Redescribed by Pease. See under: *flavescens, Helicina.*

pacifica, Marginella Plate 7, Figure 22
1868d, AJC **3:** 280, pl. 23, fig. 20 (Paumotus). Lectotype, here selected, ANSP 29415; paralectotype ANSP 391023.

pacifica, Pedicularia
1865d, PZS for 1865: 516 (Islands of the Central Pacific); 1868g, AJC **4:** 96, pl. 11, figs. 17, 18 (Apaian Island). Lectotype BMNH 1964312 selected by Kay (1965: 84, pl. 14, figs. 13, 14); paralectotypes MCZ 297958.

pacifica, Truncatella Plate 10, Figure 19
1868b, AJC **3:** 230, pl. 15, fig. 27 (Oualan [Island]). Lectotype, here selected, MCZ 59799; two paralectotypes ANSP 161791 ex MCZ.

pallens, Trochomorpha trochiformis Plate 2, Figure 5
1870c, JdeC **18:** 399 (Tahiti; Moorea); 1871d, PZS for 1871: 457 (Tahaa). Lectotype, here selected, MCZ 12188; paralectotypes MCZ 12188; *both* from Moorea.

pallida 'Pease' Pace, *Columbella*
1902, *Proceedings of the Malacological Society of London* **5:** 118 [*nomen nudum*].

pallida, Mitra
1860b, PZS **28:** 146 (Sandwich Islands). Not located in BMNH by Kay (1965: 85); type lost, *teste* Cernohorsky (1976: 292).

pallida, Taheitea [*sic*] Plate 9, Figure 17
1868b, AJC **3:** 229 (Tahiti; Huaheine). Lectotype, here selected, ANSP 12659 is the measured type specimen [as 13559a], *teste* Baker (1964: 175), no locality on label; four paralectotypes ANSP 391035; paralectotypes MCZ 178656 from Tahiti and 178660 from Huaheine.

pallidus, Triphoris Plate 10, Figure 8
1871a, PZS for 1870: 774 (Kauai). Lectotype, here selected, MCZ 50073; paralectotypes MCZ 288955.

parva, Engina
1868d, AJC **3:** 276, pl. 23, fig. 11 (Paumotus). Lectotype, here selected, ANSP 34542 is the syntype

figured by Cernohorsky (1987: 100, figs. 17, 18); paralectotypes MCZ 49995.

parva, Pterocyclos Plate 5, Figure 10
1865e, AJC **1:** 290 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 8 (Hervey Isles); Pease, 1868j, AJC **4:** 158 (Aitutake, Hervey Isles). Lectotype ANSP 13406 selected by Baker (1964: 178); two paralectotypes ANSP 372687; paralectotypes MCZ 141027, 141028, and 141029.

parvidens, Helix
1861d, PZS for 1861: 243 (Tahiti). Lectotype BPBM 170888 selected by Solem (1976: 171, figs. 77a, b); paralectotypes MCZ 17267.

parvula, Helicina
1868j, AJC **4:** 156, pl. 12, fig. 10 (Atiu [Island, Cook Islands]). Holotype ANSP 14444a, *teste* Baker (1964: 162); paratypes MCZ 297920.

parvum, Cyclostoma Plate 2, Figure 15
1865a, PZS for 1864: 674 (Islands of the Central Pacific). Lectotype, here selected, MCZ 74949; paralectotypes MCZ 187914; *both* from Tahiti.

parvus, Conus
1868h, AJC **4:** 126. New name for *Conus fusiformis* Pease 1861 non Fischer 1801 non Lamarck 1810. See under: *fusiformis, Conus.*

paucicostata, Cithara [*Cythara*] Plate 6, Figure 8
1868a, AJC **3:** 217 (Tahiti). Lectotype, here selected, MCZ 231925.

paucicostata, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Holotype BMNH 1961158, *teste* Kay (1965: 22, pl. 2, figs. 11, 12).

paucicostata, Pithys Plate 2, Figure 7
1870c, JdeC **18:** 395 (Kauai). Lectotype, here selected, MCZ 17271; paralectotypes MCZ 298476; not mentioned by Fischer-Piette (1950: 76).

paumotensis, Marginella Plate 7, Figure 23
1868d, AJC **3:** 281, pl. 23, fig. 22 (Paumotus). Lectotype, here selected, ANSP 29497; paralectotype ANSP 391050; paralectotypes MCZ 297943.

paumotensis, Scalaria Plate 9, Figure 16
1868d, AJC **3:** 289, pl. 24, fig. 11 (Paumotus). Lectotype ANSP 19581 selected by DuShane (1988 (7): 5, fig. [not numbered]) and refigured (1990: 9, fig. 34); two paralectotypes ANSP 352473; paralectotypes MCZ 187394.

paxillum, Cerithium
1861b, PZS **28:** 433 (Sandwich Islands). Lectotype BMNH 1964804 selected by Kay (1965: 47, pl. 10, fig. 6).

peasei Martens and Langkavel, *Columbella* (*Seminella*)
1871, *Donum Bismarckianum,* p. 23. New name for *Cythara varia* Pease 1860 non *Columbella varia* Sowerby 1832.

peasei Reeve, *Marginella*
1865, *Conchologia Iconica* **15:** *Marginella,* pl. 21, fig. 108. New name for *Marginella cylindrica* non Sowerby 1846 and *M. polita* Pease non Carpenter 1857. See under: *cylindrica, Marginella.*

peasei Tryon, *Triphoris*
1872d, AJC **7:** 206. New name for *T. gracilis* Pease, 1871: 777 non Pease, 1871: 774. See under: *gracilis, Triphoris.*

pellucida, Columbella
1861a, PZS **28:** 399 (Sandwich Islands). Lectotype BMNH 1962794 selected by Kay (1965: 41, pl. 10, fig. 7). Is *Columbella rorida* Reeve, *teste* Pease (1868h: AJC **4:** 122).

pellucida, Partula
1871d, PZS for 1871: 457 (Guadalcanal, Solomon Islands). Though not a type, MCZ 94837 from "Ysabel [Island] Solomon Is. (coll. Cox)" was figured by Hartman (1886: 35, pl. 2, fig. 17) as this species and by Pilsbry (1909: 297, pl. 36, fig. 6). The original lot, in the Hartman collection at the Carnegie Museum 6246, consisted of one adult and two immature examples. The former and one of the latter were transferred to the MCZ in 1935; not located in BMNH, *teste* Mordan (personal communication).

pellucidus, Pleurobranchus
1860b, PZS **28:** 145 (Sandwich Islands). Not located in BMNH by Kay (1965: 84).

perfectus, Triphoris Plate 10, Figure 15
1871a, PZS for 1870: 775 (Kauai). Lectotype, here selected, MCZ 302553; paralectotype MCZ 50075.

perlonga, Vertigo
1871d, PZS for 1871: 462 ([Nuuanu] Oahu). Holotype MCZ 48063 figured by Pilsbry and Cooke (1920: 258–259, pl. 23, figs. 1, 2).

perplexa 'Pease' H. H. Smith, *Partula*
1902, ACM **1:** 463 (Huaheine). Syntypes MCZ 25358.

perplexa, Scalaria Plate 9, Figure 11
1868d, AJC **3:** 288 (Hawaii [Island]). Lectotype [so labeled], here selected, MCZ 181978; paralectotypes MCZ 181979 and 181980.

perversa 'Pease' H. H. Smith, *Partula*
1902, ACM **1:** 442 (Tahiti). Syntypes MCZ 25317.

picea, Strigatella
1860b, PZS **28:** 146 (Sandwich Islands). Holotype BMNH 1962772 figured by Kay (1965: 28, pl. 9, fig. 9).

picta, Collonia Plate 6, Figure 21
1868g, AJC **4:** 91, pl. 11, figs. 2, 3 ([Anaa Island] Paumotus). Lectotype, here selected, MCZ 245268. Labeled, "Chosen [lectotype] by P. A. Maxwell, *ms* in prep. 1963" but apparently never published; paralectotypes MCZ 288001 and 288002; not located in ANSP.

picta, Helicina
1865b, PZS for 1864: 676 [*nomen nudum*]. MCZ 74428.

plana, Libratula Plate 5, Figure 2
1865d, PZS for 1865: 512 (Islands of the Central Pacific). Lectotype, here selected, MCZ 119162.

planilabrum, Partula
1865a, PZS for 1864: 671 (Islands of the Central Pacific [Haamene Valley, east coast of Tahaa, *teste* Garrett, 1884: 63]). Syntypes MCZ 25004 and 25298.

plicatula, Turricula (*Costellaria*) Plate 10, Figure 27
1868a, AJC **3:** 213, pl. 15, fig. 4 (Paumotus). Lectotype, here selected, ANSP 28845; four paralectotypes ANSP 391044; paralectotypes MCZ 260602.

plumbea, Planaxis
1861d, PZS for 1861: 244 (Sandwich Islands). Lectotype BMNH 1964280 selected by Kay (1965: 71, pl. 13, figs. 11, 12); paralectotypes MCZ 39062, 187835, and 207329.

polita, Marginella
1868d, AJC **3:** 280, pl. 23, fig. 19 (Tarawa Island). New name for *Marginella cylindracea* [*sic*] Pease 1863 non Sowerby 1846 non Carpenter 1857. See under: *cylindrica, Marginella.*

polita, Odostomia Plate 8, Figure 10
1868d, AJC **3:** 291, pl. 24, fig. 17 (Tahiti). Lectotype, here selected, MCZ 10562; paralectotype MCZ 298903; not located in ANSP.

porphyrostoma, Amastra
1869c, JdeC **17:** 172 (Oahu; Coll. [of] Pease). Two syntypes MCZ 45256, one of which was figured by Hyatt and Pilsbry (1911: 226, pl. 37, fig. 13).

producta, Clathurella
1860b, PZS **28:** 143 (Sandwich Islands). Lectotype BMNH 1962761 selected by Kay (1965: 19, pl. 2, figs. 3, 4); paralectotypes MCZ 49974.

producta, Omphalotropis
1869a, JdeC **17:** 151, pl. 7, fig. 8 (Tahaa); 1871d, PZS for 1871: 471 as *Atropis* (Raiatea; Tahaa). Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74932, 74933, and 187855 *all* from Tahaa.

producta, Partula
1865a, PZS for 1864: 671 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahiti). Syntypes MCZ 25016.

producta, Ranella
1861a, PZS **28:** 397 (Sandwich Islands). Holotype BMNH 1961157, *teste* Kay (1965: 37, pl. 6, figs. 17, 18).

producta, Realia
1865b, PZS for 1864: 673 (Islands of the Central Pacific); 1869a, JdeC **17:** 151, pl. 7, fig. 8 as *Omphalotropis* (Tahaa); 1871d, PZS for 1871: 476 (Raiatea) as *Atropis.* Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74943, 187855, and 187856.

propinqua 'Pease' Hartman, *Partula*
1881, BMCZ **9:** 185 (Tahaa). Syntypes MCZ 25124 and 25308.

propinqua, Terebra
1869d, AJC **5:** 66 (Hawaii [Island]). Not located in ANSP.

prostrata, Helix
1865a, PZS for 1864: 670 (Islands of the Central Pacific); 1871d, PZS for 1871: 475 ("?" Lanai). Syntypes MCZ 17343 "are *Planorbis opercularis* Gould from the West Indies," *teste* Pilsbry and Cooke (1922: 117).

protea 'Pease' Schmeltz, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; 1874, *Museum Godeffroy* (Hamburg). Catalog **5:** 92 (Raiatea) [*nomen nudum*]. MCZ 24996 and 25349.

proximus, Helicter Plate 4, Figure 1
1862a, PZS for 1862: 6 (Molokai). Lectotype, here selected, MCZ 25823.

pudica, Mitra
1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1961190 selected by Kay (1965: 27, pl. 3, figs. 11, 12).

pulchella, Clathurella
1860b, PZS **28:** 144 (Sandwich Islands). Lectotype BMNH 1962768 selected by Kay (1965: 22, pl. 2, figs. 19, 20); paralectotypes MCZ 50010.

pulchra, Auriculella
1868f, JdeC **16:** 346, pl. 14, fig. 6 ([Oahu]). Holotype and four paratypes in MNHN, *teste* Fischer-Piette (1950: 71); paratypes MCZ 161609.

pulchra, Partula varia
1871d, PZS for 1871: 473 (Huaheine); Schmeltz, 1874, *Museum Godeffroy (Hamburg). Catalog* 5: 92; [*both nomina nuda*]. MCZ 24878 and 24920.

punctata, Syphonota
1868e, AJC **4:** 77, pl. 9, fig. 2 (Huaheine). Probable syntype MCZ 297868 though labeled as from Tahiti.

punctatus, Triphoris
1871a, PZS for 1870: 775 (Annaa Island). Not located in BMNH, *teste* Way (personal communication).

purus, Conus Plate 6, Figure 23
1863d, PZS for 1862: 279 (Pacific Islands); 1871c, JdeC **19:** 98 (Niihau Island). Holotype MCZ 72331, only specimen; not located in BMNH by Kay (1965: 89).

pusilla, Columbella
1863b, PZS for 1862: 244 (Kingsmill Islands); 1868h, AJC **4:** 122 as *Columbella fusiformis* to replace *C. pusilla* non Sowerby 1844. Lectotype BMNH 1964302 selected by Kay (1965: 78, pl. 13, figs. 9, 10); paralectotypes MCZ 136617.

pusilla, Cythara
1860b, PZS **28:** 147 (Sandwich Islands). Lectotype BMNH 1962784 selected by Kay (1965: 33, pl. 10, fig. 14); paralectotypes MCZ 50003.

pusilla, Distorsio
1861a, PZS **28:** 397. Holotype BMNH 1961155, *teste* Kay (1965: 37, pl. 3, figs. 15, 16).

pusilla, Haminea
1860a, PZS **28:** 20 (Sandwich Islands). Lectotype BMNH 1962754 selected by Kay (1965: 9, pl. 9, fig. 1); paralectotypes MCZ 297879.

pusilla, Triton
1861b, PZS **28:** 434 (Sandwich Islands). Lectotype BMNH 1962818 selected by Kay (1965: 55, pl. 5, figs. 19, 20); paralectotypes MCZ 297942.

pustulosus, Triphoris Plate 10, Figure 2
1871a, PZS for 1870: 776 (Kauai). Lectotype, here selected, MCZ 50077.

putillus, Turricula
1865d, PZS for 1865: 514 (Central Pacific); 1868a, AJC **3:** 214, pl. 15, fig. 24. Holotype BMNH 1964311, *teste* Kay (1965: 81, pl. 14, figs. 7, 8); paratypes MCZ 260605.

pyriformis, Marginella Plate 7, Figure 21
1868d, AJC **3:** 280, pl. 23, fig. 21 (Paumotus). Lectotype, here selected, ANSP 29541; four paralectotypes ANSP 391061; paralectotype MCZ 24968.

pyriformis, Volvatella
1868e, AJC **4:** 73, pl. 7, fig. 5 (Huaheine). Syntypes MCZ 297944, mostly fragments.

radiata, Avicula Plate 1, Figure 4
1863c, PZS for 1862: 244 (Kingsmill Islands). Lectotype, here selected, MCZ 298466; paralectotypes MCZ 297882; not located in BMNH by Kay (1965: 86).

radiata 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 74, pl. 3, fig. 45 (Hamoa Valley, east coast of Raiatea Island, Society Islands). Lectotype ANSP 59409 selected by Baker (1963: 205) figured by Pilsbry (1909: 232, pl. 18, fig. 5); paralectotypes MCZ 24957.

radiata, Tectura
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype BMNH 1962837 selected by Kay (1965: 66, pl. 11, figs. 6, 7).

recta, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1868j, AJC **4:** 155, pl. 12, figs. 8, 9 ([Nukahiva] Marquesas [Islands]). Holotype ANSP 59789a fig. 8, *teste* Baker (1963: 205); paratypes MCZ 25338 and 25343.

reticulatus, Pleurobranchus
1860a, PZS **28:** 25 (Sandwich Islands); 1864, PZS for 1863: 510 is *Pleurobranchus violaceus* Pease 1864, new name for *P. reticulatus* Pease 1860 non Rang 1832 non Kelaart 1859; not located in BMNH by Kay (1965: 84).

retunsa, Helix
1865b, PZS for 1864: 670 (Pacific Islands); 1871d, PZS for 1871: 475 (Tahiti). Lectotype BPBM 170913 selected by Solem (1976: 412, figs. 178d–f); paralectotypes MCZ 17224.

robusta, Hydrocaena
1865b, PZS for 1864: 676 [*nomen nudum*].

robusta, Omphalotropis
1869a, JdeC **17:** 148, pl. 7, fig. 3 ([Raiatea]). Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74933 and 187853.

robusta, 'Pease' H. H. Smith, *Partula*
1865b, PZS for 1864: 675 [*nomen nudum*]; 1902, ACM **1:** 436 (Raiatea). Lectotype ANSP 59444a selected by Baker (1963: 205) figured by Pilsbry (1909: 248, pl. 18, fig. 14); paralectotypes MCZ 3651.

robustus, Stylifer
1861b, PZS **28:** 437 (Sandwich Islands). Not located in BMNH by Kay (1965: 85).

robustus, Triphoris Plate 10, Figure 12
1871a, PZS for 1870: 775 (Makaimo [Makemo Island, Taumotu Archipelago]). Lectotype, here selected, MCZ 73923; paralectotypes MCZ 298499.

roratongensis, Pithys
1870c, JdeC **18:** 395 (Roratonga); 1871d, PZS for 1871: 457. Lectotype BPBM 170885 selected by Solem (1976: 174, figs. 77e, f) who changed it to *raratongensis*; paralectotypes MCZ 17345.

rosacea, Gena Plate 6, Figure 1
1868d, AJC **3:** 284, pl. 24, fig. 1 (Paumotus). Lectotype, here selected, ANSP 40756; two paralectotypes ANSP 391033; paralectotypes MCZ 297918.

rosacea, Odostomia Plate 8, Figure 11
1868d, AJC **3:** 292, pl. 24, fig. 19 (Paumotus). Lectotype, here selected, ANSP 19959; paralectotypes MCZ 391054.

rosacea, Terebra
1869d, AJC **5:** 65 (Oahu). Not located in ANSP.

rosea, Mucronalia
1861b, PZS **28:** 437 (Sandwich Islands). Holotype BMNH 1962809, *teste* Kay (1965: 64, pl. 11, fig. 1).

rotella, Diadema
1868j, AJC **4:** 158, pl. 12, fig. 13 (Atiu [Island, Cook Islands]). Holotype ANSP 13409a, *teste* Baker (1964: 178).

rotellina, Pithys
1870c, JdeC **18:** 393 (Aitutake [Island, Cook Islands]); 1871d, PZS for 1871: 453. Lectotype BPBM 2312 selected by Solem (1976: 139, figs. 62e, f); paralectotypes MCZ 176559.

rubella, Succinea Plate 4, Figure 13
1871d, PZS for 1871: 460 (Lanai). Lectotype, here selected, MCZ 161671; paralectotypes MCZ 298475.

rubicunda, Helicina maugeriae Plate 5, Figure 12
1865a, PZS for 1864: 676 [*nomen nudum*]; 1868d, AJC **3:** 227: 1871d, PZS for 1871: 466 (Raiatea). Lectotype ANSP 14512 selected by Baker (1964: 162) labeled as from Tahiti; paralectotypes MCZ 314014 from Raiatea.

rubida, Catinella Plate 4, Figure 21
1870a, JdeC **18:** 97 (Kauai). Lectotype, here selected, MCZ 45252, probable measured type.

rubida, Dentiora Plate 7, Figure 7
1863b, PZS for 1862: 240 (Sandwich Islands). Lectotype, here selected, MCZ 297951, probable measured type; not located in BMNH by Kay (1965: 86).

rubida, Neritina
1865d, PZS for 1865: 514 (Islands of the Central Pacific); 1868d, AJC **3:** 285, pl. 24, fig. 5 (Tahiti). Lectotype BMNH 1964313 selected by Kay (1965: 82, pl. 14, figs. 15, 16); paralectotypes MCZ 89902; Baker (1964: 160) questions if ANSP 37675a is the figured type since the measurements are not close to those of Pease.

rubra, Alcyna
1861b, PZS **28:** 436 (Sandwich Islands). Lectotype BMNH 1962828 selected by Kay (1965: 62, pl. 7, figs. 5, 6); paralectotypes MCZ 31720 and 205584.

rubra, Odostomia Plate 8, Figure 12
1868d, AJC **3:** 291, pl. 24, fig. 18 ([Anaa Island] Paumotus). Lectotype, here selected, ANSP 19955; paralectotypes ANSP 391054; paralectotype MCZ 10488.

rudis, Neritina
1868d, AJC **3:** 285, pl. 24, fig. 4 (Ponape). Holotype ANSP 37543a, *teste* Baker (1964: 160); paratypes MCZ 73518.

rufescens, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*]. MCZ 297926.

rufus, Pleurobranchus
1860a, PZS **28:** 25 (Sandwich Islands). Syntype MCZ 297872; not located in BMNH by Kay (1965: 84).

rugata, Helix Plate 3, Figure 3
1866b, AJC **2:** 291 (Sandwich Islands); 1871d, PZS for 1871: 474 as *Endodonta* (Maui). Lectotype, here

selected, MCZ 17237; paralectotypes MCZ 298479; not located in ANSP by Baker (1963: 233) or elsewhere by Solem (1976: 377).

rugulosa, Amastra
1870a, JdeC **18:** 95 (Kauai); Crosse, 1876, JdeC **24:** 99, pl. 1, figs. 4, 4a. Holotype and fragment of paratype in MNHN, *teste* Fischer-Piette (1950: 149 as second reference to *A. A. rugulosa* only); paratypes MCZ 45255.

rugulosa, Helicina Plate 5, Figure 7
1868j, AJC **4:** 157, pl. 12, fig. 11 (Tahaa). Lectotype, here selected, MCZ 297922; paralectotypes MCZ 298467; not located in ANSP by Baker (1964: 162).

rugulosum, Sistrum Plate 9, Figure 8
1868g, AJC **4:** 93, pl. 11, fig. 7 (Howland [Island]). Lectotype, here selected, ANSP 36740; two paralectotypes ANSP 391042; paralectotypes MCZ 295581.

rustica, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 199 (Tahitian Archipelago); 1867a, AJC **3:** 81, pl. 1, fig. 5; 1871d, PZS for 1871: 473 (Raiatea). Holotype ANSP 59480 selected as lectotype by Baker (1963: 205); paralectotypes MCZ 25140 and 25302.

rutella, Succinea
1865b, PZS for 1864: 675 [*nomen nudum*]. MCZ 155141.

sagitta 'Pease' Pace, *Columbella*
1902, *Proceedings of the Malacological Society of London* **5:** 132 [*nomen nudum*].

saltata, Mitra Plate 7, Figure 18
1865d, PZS for 1865: 512 (Islands of the Central Pacific). Lectotype MCZ 260613 [not 260605] selected by Cernohorsky (1976: 501, pl. 450, fig. 2); two paralectotypes MCZ 298462; not located in BMNH by Kay (1965: 86).

sandwicensis, Daphnella Plate 7, Figure 6
1860b, PZS **28:** 148 (Sandwich Islands). Lectotype, here selected, MCZ 49993; paralectotype MCZ 298491; not located in BMNH by Kay (1965: 85).

sandwicensis, Erato
1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1962776 selected by Kay (1965: 31, pl. 9, fig. 10); paralectotypes MCZ 297959.

sandwicensis, Marginella
1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1962778 selected by Kay (1965: 31, pl. 9, fig. 11); paralectotype MCZ 24970.

sandwicensis, Oliva
1860b, PZS **28:** 145 (Sandwich Islands). Lectotype BMNH 1961188 selected by Kay (1965: 25, pl. 3, figs. 9, 10).

sandwicensis, Patella Plate 1, Figure 8
1861b, PZS **28:** 437 (Sandwich Islands). Lectotype, here selected, MCZ 304058; paralectotypes MCZ 38803 and 150789; not located in BMNH by Kay (1965: 85).

sandwicensis, Pedipes
1860b, PZS **28:** 146 (Sandwich Islands). Holotype BMNH 1962775 figured by Kay (1965: 30, pl. 9, fig. 7); paratypes MCZ 74813.

sandwicensis, Tornatina
1860a, PZS **28:** 19 (Sandwich Islands). Lectotype BMNH 1962751 selected by Kay (1965: 6, pl. 9, fig. 4); paralectotypes MCZ 31712 with the note by Pilsbry "seems to be two species, but they are so worn I cannot be sure."

sandwicensis, Turbo
1861b, PZS **28:** 436 (Sandwich Islands). Holotype BMNH 1961179, *teste* Kay (1965: 60, pl. 7, figs. 7, 8).

sandwichensis, Columbella Plate 6, Figure 22
1861d, PZS for 1861: 244 (Sandwich Islands); 1868h, AJC **4:** 122 is *Columbella turturina* Lamarck (1822). Lectotype, here selected, MCZ 297950; paralectotypes MCZ 298472; not located in BMNH by Kay (1965: 86).

sandwichensis 'Pease' Nevill, *Fossar*
1884, *Hand List of Mollusca in the Indian Museum* **2:** 165 [*nomen nudum*]. MCZ 242384.

sandwichensis, Vitularia
1861a, PZS **28:** 397 (Sandwich Islands). Lectotype BMNH 1961182 selected by Kay (1965: 36, pl. 4, figs. 1, 2).

scalariformis, "?" Cyclophorus
1865e, AJC **1:** 289 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 6, as *Pupoidea* (Hervey Isles); Pease, 1871d, PZS for 1871: 465 as *Palaina* (Caroline Islands). Holotype ANSP 13360, *teste* Baker (1964: 165).

scalariformis, Realia
1865e, AJC **1:** 288 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 3 (Oualan Island); Pease, 1869a, JdeC **17:** 159 as *Scallinella* (Atiu). Holotype ANSP 13362a, *teste* Baker (1964: 178); paratypes MCZ 74935, 176572, and 187839 *all* from Atiu.

sculpta, Nucula
1860c, PZS **28:** 189 (Corea [Korea] Sea). Not mentioned by Kay (1965).

sculptilis, Coralliobia
1865d, PZS for 1865: 513 (Islands of the Central Pacific). Not located in BMNH by Kay (1965: 86).

sculptilis, Helix
1865a, PZS for 1864: 669 (Mangier [error for Mangaia, Cook Islands]); 1867b, AJC **3:** 104 as *Helix fratercula* to replace *H. sculptilis* 1865 non Bland 1868. Lectotype BMNH 1962705 selected by Solem (1976: 423 [not figured]); paralectotypes MCZ 17206.

sculptilis, Terebra Plate 8, Figure 18
1869d, AJC **5:** 64 ([Honolulu] Oahu). Lectotype MCZ 248804, *teste* Bratcher and Cernohorsky (1987: 40) presumed here to have been selected by them; paralectotype MCZ 248805.

sculptum, Cerithium
1869d, AJC **5:** 77, pl. 8, fig. 8 (Paumotus). Holotype ANSP 17592, *teste* Houbrick (1992: 49, fig. 31h).

scuta, Helix
1865a, PZS for 1864: 675 [*nomen nudum*].

sectilis, Mitra
1868d, AJC **3:** 271 (Hawaii [Island]). Not located in ANSP.

semicostata, Rissoa
1868d, AJC **3:** 296, pl. 24, fig. 32 (Paumotus). Type lost, label only in ANSP.

semicostatus, Turbo
1861b, PZS **28:** 435 (Sandwich Islands). Lectotype BMNH 1961202 selected by Kay (1965: 60, pl. 7, figs. 3, 4); paralectotypes MCZ 297920.

semiplicata, Melampus (*Tralia*)
1860b, PZS **28:** 146 (Sandwich Islands). Lectotype BMNH 1962773 selected by Kay (1965: 30, pl. 4, fig. 7); paralectotypes MCZ 176566.

semiplicata, Rissoina
1863b, PZS for 1862: 242 (Pacific Islands); 1868d, AJC **3:** 295, pl. 24, fig. 29 (Howland Island). Lectotype BMNH 1964294 selected by Kay (1965: 76, pl. 13, figs. 3, 4).

semiplicata, Vanikoro
1861b, PZS **28:** 435 (Sandwich Islands). Holotype BMNH 1962819, *teste* Kay (1965: 57, pl. 6, figs. 7, 8).

semistriata, Amphiperas
1863b, PZS for 1862: 241 (Pacific Islands); 1868g, AJC **4:** 96, pl. 11, fig. 16 (Ponape). Lectotype 1964286 selected by Kay (1965: 74, pl. 12, figs. 5, 6). Cate (1973: 112, fig. 138) apparently unaware that Kay had previously selected a lectotype for this species, or that Pease had later figured it and stated its locality as Ponape Island, refigured ANSP 17042 as the holotype and restricted the type locality to: 73 m, Kii Channel, Japan (24°00′N, 134°48′E). This restriction is therefore invalid.

semistriata, Atys
1860a, PZS **28:** 20 (Sandwich Islands). Holotype BMNH 1961459, *teste* Kay (1965: 10, pl. 1, figs. 7, 8); paratypes MCZ 31716 largest figured by Pilsbry (1917: 217, fig. 5) and 31717.

serrata, Lamellina Plate 2, Figure 17
1861c, PZS **28:** 439 (Ebon Island). Lectotype, here selected, MCZ 302555; paralectotypes MCZ 28926 and 298484; paralectotype ANSP figured by Pilsbry and Cooke (1915: 165, pl. 33, figs. 1, 2); not located in ANSP by Baker (1963: 199).

similaris, Amastra rugulosa Plate 2, Figure 11
1870a, JdeC **18:** 96 ([Waimea] Kauai). Lectotype, here selected, MCZ 45253; paralectotypes MCZ 58936 and 298498.

similis, Triphoris Plate 10, Figure 14
1871a, PZS for 1870: 774 ([Haena] Kauai). Lectotype, here selected, MCZ 50079.

simillima, Haminea Plate 4, Figure 24
1868e, AJC **4:** 72, pl. 7, fig. 3 (Tahiti). Lectotype, here selected, MCZ 297875; paralectotypes MCZ 303194.

simillima, Helix
1865a, PZS for 1864: 669 (Islands of the Central Pacific [Raiatea, *teste* Garrett, 1884: 19, pl. 2, figs. 32, 32a, b]). Lectotype, here selected, ANSP 49288 is the specimen figured by Garrett; not located in BMNH, *teste* Mordan (personal communication).

simplaria, Vertigo
1871d, PZS for 1871: 461 (Marquesas Islands). Not located in BMNH, *teste* Mordan (personal communication).

simplex, Leptachatina
1869c, JdeC **17:** 170 (Hawaii [Island]). Measured holotype in MNHN, *teste* Fischer-Piette (1950: 73); paratype ANSP 57821 figured by Cooke (1910: 38, pl. 1, figs. 8, 9); paratypes MCZ 45176.

simplex, Olivella (*Callianax*) Plate 8, Figure 16
1868d, AJC **3:** 281, pl. 23, fig. 24 (Paumotus). Lectotype, here selected, ANSP 28969; paralectotype ANSP 391047.

simplex, Tornatellina Plate 4, Figure 8
1865a, PZS for 1864: 673 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahaa). Lectotype, here selected, MCZ 175745; paralectotypes MCZ 298473.

simulans, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 202 ([Moorea] Tahitian Archipelago); 1867a, AJC **3:** 81, pl. 1, fig. 11. Lectotype ANSP 59941 selected by Baker (1963: 205); paralectotypes MCZ 24881, 24955, and 25116.

siniatralis 'Pease' Pilsbry, *Partula*
1909, MofC (2) **20:** 185. Manuscript name under the synonymy of *Partula otaheitana* Bruguière.

sinistrosa 'Pease' Garrett, *Partula*
1865a, PZS for 1864: 675 [*nomen nudum*]; Garrett, 1884, JANSP (2) **9:** 49 (Papieri, Tahiti). Lectotype ANSP 59548a selected by Baker (1963: 205) figured by Pilsbry (1909: 191, pl. 26, fig. 1); paralectotypes MCZ 24997 and 297864.

solida, Amastra
1869c, JdeC **17:** 173 (Oahu; Coll. [of] Pease [and] Crosse). Three syntypes MCZ 23341 and 141338 figured by Pilsbry and Cooke (1914: 28, 31, pl. 7, figs. 1–3); syntype in MNHN, *teste* Fischer-Piette (1950: 73).

solida, Helicina Plate 5, Figure 3
1865a, PZS for 1864: 673 (Islands of the Central Pacific [Tahiti]). Lectotype, here selected, MCZ 297923; paralectotypes MCZ 302379.

soliduscula 'Pease' Sowerby, *Magilus*
1872 [*in*] Reeve, *Conchologia Iconica* **18:** *Magilus*, pl. 4, fig. 12 (Sandwich Islands). Holotype in BMNH, *teste* Sowerby.

speciosa, Philinopsis
1860a, PZS **28:** 21 (Sandwich Islands). Syntype MCZ 297874; not located in BMNH by Kay (1965: 84).

sphaerica, Amastra
1870a, JdeC **18:** 94 ([Waimea] Kauai); Crosse, 1876, JdeC **24:** 98, pl. 1, figs. 5, 5a. Holotype and paratypes in MNHN, *teste* Fischer-Piette (1950: 149 as first reference to *A. A. rugulosa*); paratypes MCZ 45162.

squamosum, Sistrum
1868d, AJC **3:** 277, pl. 23, fig. 14 (Kingsmill [Island]). Lectotype ANSP 29910 selected by Cernohorsky (1987: 97, figs. 10, 11) is the figured type; paralectotypes MCZ 295583.

squamosus, Latirus
1863b, PZS for 1862: 240 (Pacific Islands); 1868d, AJC **3:** 278, pl. 23, fig. 16 (Baker Island). Lectotype

BMNH 1964284 selected by Kay (1965: 72, pl. 12, figs. 12, 13); paralectotypes MCZ 2192 and 261183.

squamulosa, Fastigiella Plate 7, Figure 14
1868d, AJC **3:** 290, pl. 24, fig. 15 ([Anaa Island] Paumotus). Lectotype, here selected, ANSP 36702; paralectotype ANSP 391037; paralectotypes MCZ 297956.

stolida, Partula
1866a, AJC **2:** 198 (Tahitian); 1871d, PZS for 1871: 473 (Raiatea). Syntypes MCZ 25311 and 104508 labeled as from Tahiti; not located in ANSP by Baker (1963: 205).

straminea, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*]. MCZ 176563.

striata, Alcyna
1869d, AJC **5:** 70 (Hawaii [Island]). Not located in ANSP.

striata, Chondrella Plate 2, Figure 19
1871d, PZS for 1871: 477 (Roratonga [Raratonga Island, Cook Islands]). Lectotype, here selected, MCZ 187917; paralectotypes MCZ 74942.

striata, Engina
1868d, AJC **3:** 275, pl. 23, fig. 10 (Paumotus). Not located in ANSP.

striata, Odostomia Plate 8, Figure 14
1868d, AJC **3:** 291, pl. 24, fig. 16 (Paumotus). Lectotype, here selected, MCZ 10491; paralectotypes MCZ 303452 and ANSP 58022.

striatula, Rissoina Plate 9, Figure 4
1868d, AJC **3:** 296, pl. 24, fig. 31 (Paumotus). Lectotype, here selected, MCZ 178844 labeled as holotype; two paralectotypes ANSP 19254.

striatula Vertigo
1871d, PZS for 1871: 461 ([Kalapana, Puna] Hawaii [Island]). Lectotype, here selected, MCZ 45239 [not 45234] figured by Pilsbry and Cooke (1926: 223, pl. 28, figs. 1, 2); paralectotypes MCZ 151647 and BPBM ex MCZ.

striatum, Sistrum Plate 9, Figure 9
1868d, AJC **3:** 276, pl. 23, fig. 12 (Kingsmill [Islands]). Lectotype, here selected, ANSP 36735; three paralectotypes ANSP 391063; paralectotypes MCZ 178941.

striatus, Melampus (*Tralia*)
1861d, PZS for 1861: 244 (Tahiti); 1868g, AJC **4:** 100, pl. 12, fig. 14. Lectotype ANSP 22356a selected by Baker (1964: 151); a lectotype BMNH 1964282 was later also selected by Kay (1965: 71, pl. 12, figs. 8, 10).

strigata, Cythara Plate 6, Figure 9
1863b, PZS for 1862: 242 (Pacific Islands [Howland Island]). Lectotype, here selected, MCZ 49990; paralectotypes MCZ 298490; not located in BMNH by Kay (1965: 86).

strigata, Partula
1868j, AJC **4:** 155, pl. 12, fig. 7 (Marquesas [Islands]). Holotype ANSP 59510a, *teste* Baker (1963: 205).

strigata, Pisania
1863b, PZS for 1862: 241 (Pacific Islands); 1868g, AJC **4:** 93, pl. 11, fig. 6 (Ponape). Lectotype BMNH 1964288 selected by Kay (1965: 73, pl. 12, figs. 16, 17).

striolata, Helix Plate 2, Figure 2
1861c, PZS **28:** 439 (Ebon Island). Lectotype, here selected, MCZ 11563; paralectotypes MCZ 298474.

striolata, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 195 (Tahitian Archipelago [Moorea]); 1867a, AJC **3:** 81, pl. 1, fig. 4. Lectotype ANSP 59648a selected by Baker (1963: 205) is the figured type; paralectotypes MCZ 24910, 25293, and 25303.

subangulata, Alcyna
1861b, PZS **28:** 436 (Sandwich Islands). Holotype BMNH 1962830 figured by Kay (1965: 63, pl. 9, fig. 6); paratype MCZ 31723 is now the figured holotype of *Alcyna subangulata flammulata* Pilsbry (1917: 213, pl. 15, figs. 5, 6).

subangulata, Partula faba
1870c, JdeC **18:** 401 (Tahaa); 1871d, PZS for 1871: 458. Syntypes MCZ 24948.

subpellucida, Eulima Plate 7, Figure 12
1868g, AJC **4:** 94 (Tahiti). Lectotype, here selected, MCZ 31709; paralectotypes MCZ 303450. The type figured by Reeve (1865, *Conchologia Iconica* **15:** *Eulima*, pl. 3, figs. 20a, b); was not located in BMNH by Kay (1965: 86).

subrufa, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*].

subrufa 'Pease' Garrett, *Helicina*
1884, JANSP (2) **9:** 104, pl. 3, figs. 68, 68a, b (Raiatea and Borabora). Lectotype ANSP 14463a selected by Baker (1964: 162).

subviridis, Vitrina
1868j, AJC **4:** 154, pl. 12, fig. 5 (Marquesas [Islands]). Holotype ANSP 49269a, *teste* Baker (1963: 237).

suffusa, Terebra Plate 9, Figure 18
1869d, AJC **5:** 67 ([Honolulu] Oahu). Lectotype MCZ 248802 selected by Bratcher and Cernohorsky (1987: 47, pl. 5, fig. 17b); paralectotype MCZ 248803.

sulcata, Terebra Plate 8, Figure 1
1869d, AJC **5:** 67 ([Honolulu] Oahu). Lectotype, here selected, MCZ 49967; paralectotypes MCZ 248801.

sulcifera, Torinia
1869d, AJC **5:** 79 (Kauai). Not located in ANSP.

sulcosus, Triphoris Plate 10, Figure 3
1871a, PZS for 1870: 774 (Kauai). Lectotype, here selected, MCZ 50080; paralectotype MCZ 298496.

suturalis, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]. MCZ 24825.

symmetrica, Scalaria
1868d, AJC **3:** 290, pl. 24, fig. 14 (Tahiti). Holotype ANSP 19586 refigured by DuShane (1988 (7): 5, fig. [not numbered]) and (1990: 9, fig. 44).

tahitensis, Cyclostoma
1861d, PZS for 1861: 243 (Huaheine); 1869b, JdeC **17:** 158, pl. 7, fig. 1, as *Scalinella*. Holotype in MNHN, *teste* Fischer-Piette (1950: 72); paratypes MCZ 74941, 187858, 187859, and 187860.

tahitensis, Dolabrifera
1861d, PZS for 1861: 245 (Tahiti); 1868e, AJC **4:** 77, pl. 8, fig. 5; not located in BMNH by Kay (1965: 86).

tahitensis, Helicina
1871d, PZS for 1871: 466. New name for *Helicina pisum* Rousseau 1854 non Philippi 1847.

tahitensis 'Pease' Brot, *Melania*
1877 [*in*] Martini and Chemnitz, *Conchylien Cabinet (2)* **1** pt. 24, Die Melaniaceen, p. 323 [*nomen nudum*]. Listed as a synonym of *M. mauiensis* Lea.

tahitensis, Tectura Plate 1, Figure 7
1868g, AJC **4:** 98, pl. 11, fig. 21 (Tahiti). Lectotype, here selected, ANSP 38949; paralectotype MCZ 150757.

tenebrosa, Leptachatina
1870a, JdeC **18:** 92 ([Waimea] Kauai); Crosse, 1876, JdeC **24:** 97, pl. 3, fig. 5. Holotype in MNHN, *teste* Fischer-Piette (1950: 149); paratypes MCZ 45189 and 50110.

tenuicostata, Leptachatina
1869c, JdeC **17:** 170 (Hawaii Island). Holotype in MNHN figured by Fischer-Piette (1950: 72, pl. 3, fig. 51).

tenuiscula, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*]; 1868b, AJC **3:** 226 [*nomen nudum*] (Tahaa).

tenuistriata, Helicina
1865a, PZS for 1864: 676 [*nomen nudum*]; 1868b, AJC **3:** 226 (Tahaa) [*nomen nudum*].

tenuistriata, Rissoina Plate 9, Figure 5
1868d, AJC **3:** 295, pl. 24, fig. 30 (Paumotus). Lectotype, here selected, ANSP 19253; paralectotypes MCZ 178851.

terrestris 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 75 (. . . Opoa Valley on the southeast coast [of Raiatea]). Lectotype ANSP 59450a selected by Baker (1963: 205) figured by Pilsbry (1909: 243, pl. 17, fig. 11); paralectotypes MCZ 25296 and 297859.

tessellatus, Pleurobranchus
1861d, PZS for 1861: 245 (Pacific Islands) [description without name]; named, 1864, PZS for 1863: 510; 1868e, AJC **4:** 80, pl. 9, fig. 4; not mentioned by Kay (1965).

triangulatum, Sistrum Plate 9, Figure 23
1868d, AJC **3:** 278, pl. 23, fig. 15 (Hawaii [Island]). Lectotype, here selected, MCZ 295580; paralectotypes MCZ 295589; not located in ANSP.

tricarinatum, Bittium
1861c, PZS **28:** 433 (Sandwich Islands). Holotype BMNH 1962806, *teste* Kay (1965: 49, pl. 5, fig. 14).

trigonalis, Pinna Plate 1, Figure 2
1861a, PZS for 1861: 242 (Kingsmill Islands). Lectotype, here selected, MCZ 225951; not located in BMNH by Kay (1965: 86).

trilineata, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 195 (Tahiti); 1867a, AJC **3:** 81, pl. 1, fig. 1. Lectotype ANSP 59563a selected by Baker (1963: 205) is the figured type; paralectotypes MCZ 24940 and 25130.

triplicata, Auriculella Plate 2, Figure 9
1868f, JdeC **16:** 346 ([Oahu]). Lectotype, here selected, MCZ 45150; paralectotypes MCZ 298487; not located in MNHN by Fischer-Piette (1950: 71).

triticea, Rissoina
1861b, PZS **28:** 438 (Sandwich Islands). Holotype BMNH 1962844 figured by Kay (1965: 68, pl. 11, fig. 11); paratypes MCZ 178859.

triticea, Triphoris
1861b, PZS **28:** 433 (Sandwich Islands). Holotype BMNH 1962807, *teste* Kay (1965: 50, pl. 10, fig. 3).

tuberculatus, Triphoris Plate 10, Figure 4
1871a, PZS for 1870: 776 (Kauai). Lectotype, here selected, MCZ 50081; paralectotypes MCZ 298497.

tuberculiferum, Cerithium
1869d, AJC **5:** 76 (Paumotus). Figured by Sowerby [*in*] Reeve, 1865, *Conchologia Iconica* **15:** *Cerithium*, pl. 2, fig. 11 (Island of Annaa, Cuming) as *Cerithium adansonii* 'Bruguière' Sowerby non Bruguière 1792. Holotype BMNH 199021; paratypes MCZ 302380.

tuberculosa, Engina
1863b, PZS for 1862: 243 (Pacific Islands); 1867d, AJC **3:** 274 (Baker Island). Lectotype BMNH 1964296 selected by Kay (1965: 76, pl. 14, figs. 5, 6); paralectotypes MCZ 260616.

tumida, Clathurella Plate 6, Figure 18
1868a, AJC **3:** 218, pl. 15, fig. 14 (Paumotus). Lectotype, here selected, ANSP 15813 is the figured type; two paralectotypes ANSP 391053; paralectotypes MCZ 231968 and 231969.

tumida, Hyalopsis
1871f, AJC **7:** 27, pl. 9, fig. 6 (Solomon Islands). Not located in ANSP.

turbinatus, Omphalius Plate 8, Figure 20
1869e, AJC **5:** 84, pl. 8, fig. 15 (Gulf of [Golfo de] California, La Paz [Baja California Sur, Mexico]). Lectotype ANSP 40820 selected by Pilsbry (1932: 85, pl. 10, figs. 9, 9a, 9b); paralectotype ANSP 31053.

turbinella, Helicina
1865b, PZS for 1864: 676 [*nomen nudum*].

turgidula, Leptachatina
1870a, JdeC **18:** 89 ([Waimea] Kauai); Crosse, 1876, JdeC **24:** 96, pl. 4, fig. 5. Holotype in MNHN, *teste* Fischer-Piette (1950: 149); paratypes MCZ 45182 and 45183.

turgidula, Limnaea Plate 4, Figure 11
1870b, AJC **6:** 5, pl. 3, fig. 3 (Oahu). Lectotype, here selected, MCZ 298901; paralectotype MCZ 298902; two paralectotypes ANSP 21932 though not located in ANSP by Baker (1964: 154).

turgidus, Bulimus [*Partula*]
1865a, PZS for 1864: 670 (Islands of the Central Pacific); 1871d, PZS for 1871: 473 (Tahiti). Probable syntypes MCZ 25367 and 26354 though *both* labeled as from Raiatea.

turricula, Partula
1865d, PZS for 1864: 675 [*nomen nudum*]; 1872b, AJC **7:** 196 ("?" New Hebrides). Holotype ANSP 59926a, *teste* Baker (1963: 205).

turricula, Rissoina
1861b, PZS **28:** 438 (Sandwich Islands). Lectotype BMNH 1962845 selected by Kay (1965: 69, pl. 11, fig. 10); paralectotypes MCZ 178858.

ualanensis 'Pease' Martens and Langkavel, *Melania*
1871, *Donum Bismarckianum*, p. 38. Error for *oualanensis* 'Pease' Tryon, *Melania*.

umbilicata, Cassis Plate 6, Figure 3
1861b, PZS **28:** 436 (Sandwich Islands). Lectotype, here selected, MCZ 298907; not located in BMNH by Kay (1965: 85).

umbilicata, Partula
1865a, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 200 ([Haamene Valley, Tahaa] Tahitian Archipelago); 1867a, AJC **3:** 81, pl. 1, fig. 7. Lectotype ANSP 59452a selected by Baker (1963: 205) from one of the syntypes figured by Pilsbry (1909: 230, pl. 21, figs. 13, 14); paralectotypes MCZ 25300 and 25310.

umbilicata, Scalaria Plate 9, Figure 12
1869d, AJC **5:** 76 (Oahu). Holotype MCZ 187393 figured by DuShane (1990: 4, fig. 9).

undatolirata 'Pease' Dall, *Patella*
1871, AJC **6:** 279 (Sandwich Islands) [*nomen nudum*]; Pease, 1872c, AJC **7:** 198 listed as a synonym of *Helcionisus exaratus* Nuttall.

undulata 'Pease' Tryon, *Natica*
1886, MofC (1) **8:** 23 [*nomen nudum*].

unilineatum, Cerithium
1861b, PZS **28:** 432 (Sandwich Islands). Lectotype BMNH 1962798 selected by Kay (1965: 45, pl. 10, fig. 5); paralectotypes MCZ 297946.

uniplicata, Auriculella
1868f, JdeC **16:** 344, pl. 14, figs. 7, 7a ([Lahaina] Maui). Two figured syntypes in MNHN, *teste* Fischer-Piette (1950: 71); syntypes MCZ 159563 and 161636.

varia, Cythara
1860b, PZS **28:** 147 (Sandwich Islands). Lectotype BMNH 1962782 selected by Kay (1965: 33, pl. 10, fig. 13); paralectotypes MCZ 50000, 50001, and 50002. See under: *peasei*, Martens and Langkavel, *Columbella* (*Seminella*).

variabilis, Carelia
1870c, JdeC **18:** 402 (Kauai). Single specimen found by Pease; not mentioned by Fischer-Piette (1950: 76).

variabilis, Collonia
1861b, PZS **28:** 436 (Sandwich Islands). Lectotype BMNH 1963331 selected by Robertson [*in*] Kay (1965: 61, pl. 7, figs. 1, 2); paralectotypes MCZ 119269.

variabilis, Engina Plate 7, Figure 5
1868d, AJC **3:** 275, pl. 23, fig. 6 (Paumotus). Lectotype MCZ 260618 selected by Cernohorsky (1987: 99, figs. 11, 12); paralectotypes MCZ 260615.

variabilis, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 203 ([Vaioara Valley, on the west coast of Raiatea, *teste* Hartmann, 1884: 76] Tahitian Archipelago); 1867a, AJC **3:** pl. 1, figs. 12–14; 1871, PZS for 1871: 473 (Raiatea). Lectotype ANSP 59452a selected by Baker (1963: 205) is the syntype represented on pl. 1, fig. 12; paralectotypes MCZ 24994.

variabilis, Realia
1865e, AJC **1:** 288 (Polynesia); Tryon, 1866a, AJC **2:** 82, pl. 5, fig. 2 (Hervey Isles); Pease, 1869a, JdeC **17:** 148 as *Omphalotropis* (Atiu); 1872b, AJC **7:** 197 (also Tongan Group). Holotype ANSP 13341a, *teste* Baker (1964: 179); paratypes MCZ 187844 and 187847 from Atiu; paratypes MCZ 187846 from the Tongan Group.

varians, Pleurobranchus
1860a, PZS **28:** 25 (Sandwich Islands). Not located in BMNH by Kay (1965: 84).

varicifera, Daphnella
1868a, AJC **3:** 221, pl. 15, fig. 21 (Paumotus). Holotype ANSP 15726.

variegata, Dolabella
1860a, PZS **28:** 22 (Sandwich Islands). Syntype MCZ 297871; not located in BMNH by Kay (1965: 84).

venosus, Helix
1866b, AJC **2:** 290, pl. 21, fig. 2 (Polynesia); 1871d, PZS for 1871: 475 as *Helicopsis* (Roratonga). Holotype ANSP 49163a, *teste* Baker (1963: 237); paratypes MCZ 11529 and 297935.

venusta 'Pease' Pace, *Columbella*
1902, *Proceedings of the Malacological Society of London* **5:** 150 [*nomen nudum*].

venusta, Eulima Plate 7, Figure 10
1868d, AJC **3:** 294, pl. 24, fig. 24 (Tahiti). Lectotype, here selected, ANSP 19788; paralectotypes MCZ 187748 and 187749.

verecunda, Pithys
1870c, JdeC **18:** 397 (Marquesas [Islands]); 1871d, PZS for 1871: 454 as *Pitys*. Not mentioned by Fischer-Piette (1950: 76).

verticillata, Helix Plate 3, Figure 7
1865b, PZS for 1864: 675 [*nomen nudum*]; 1868b, AJC **3:** 228 as *Nanina* (Moorea). Holotype ANSP 49284, *teste* Baker (1963: 237).

vescoi 'Dohrn' Pease, *Helicina*
1865b, PZS for 1864: 676 [*nomen nudum*].

vexillum, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 198 (Tahitian Archipelago); 1867a, AJC **3:** 81, pl. 1, fig. 8; 1871d, PZS for 1871: 474 (Moorea). Lectotype ANSP 59646a selected by Baker (1963: 205); paralectotypes MCZ 24814, 24886, and 24936.

violacea, Clathurella Plate 6, Figure 15
1868a, AJC **3:** 218, pl. 15, fig. 15 (Paumotus). Lectotype, here selected, MCZ 231971; paralectotypes MCZ 303190; not located in ANSP.

violaceus, Pleurobranchus
1864, PZS for 1863: 510. New name for *Pleurobranchus reticulatus* Pease 1860 non Rang 1832 non Kelaart 1859. See under: *reticulatus, Pleurobranchus*.

virescens, Pachypoma Plate 8, Figure 17
1869d, AJC **5:** 73, pl. 8, fig. 10 (Tarawa Island). Lectotype, here selected, MCZ 302624; paralectotypes MCZ 302625; not located in ANSP.

virginea, Partula
1865a, PZS for 1864: 675 [*nomen nudum*].

virginea 'Pease' Garrett, *Partula*
1884, JANSP (2) **9:** 61, pl. 3, fig. 54 (Vaipiti Valley on the west coast of Tahaa). Lectotype ANSP 59474a selected by Baker (1963: 206) is the figured type; paralectotypes MCZ 25243.

virgulata, Partula assimilis
1870c, JdeC **18:** 401 (Roratonga). Syntypes MCZ 24939; not mentioned by Fischer-Piette (1950: 76).

viridans, Cyclostoma
1865b, PZS for 1864: 676 [*nomen nudum*].

viridescens, Cyclostoma
1861d, PZS for 1861: 243 (Pacific Islands); 1869a, JdeC **17:** 153, pl. 7, fig. 7, as *Omphalotropis* (Huaheine). Holotype in MNHN, *teste* by Fischer-Piette (1950: 72).

viridis, "?" Acanthochites
1872a, AJC **7:** 194 (Kauai). Not located in ANSP.

viridis, Carelia variabilis
1870c, JdeC **18:** 402 (east side of Kauai). Pilsbry and Cooke (1914: 16, pl. 9, fig. 11) suggested that this figured specimen MCZ 23343 may be the type of *viridis;* not mentioned by Fischer-Piette (1950: 76).

viridis, Lobiger Plate 4, Figure 18
1864, PZS for 1863: 510 ([Tahiti] Pacific Islands); 1861d, PZS for 1861: 246, description without a name. Lectotype, here selected, MCZ 297869; paralectotypes MCZ 298463.

viridis, Lophcercus
1861d, PZS for 1861: 246 (Pacific Islands); 1868e, AJC **4:** 74, pl. 8, figs. 1, 2. Lectotype BMNH 1964324 selected by Kay (1965: 72, pl. 12, figs. 7, 8); paralectotype MCZ 297932.

vitrea, Bullina
1860a, PZS **28:** 19 (Sandwich Islands). Lectotype BMNH 1961456 selected by Kay (1965: 5, pl. 1, figs. 1, 2).

vitrea 'Pease' Dohrn, *Tornatellides*
1863, *Malakozoologische Blätter* **10:** 162. Not recognizable, *teste* Pilsbry and Cooke (1915: 203).

vittata, Partula
1865b, PZS for 1864: 675 [*nomen nudum*]; 1866a, AJC **2:** 194 (Tahitian Archipelago [restricted to the higher portions of Toloa Valley, on the west coast of Raiatea, *teste* Garrett, 1884: 75]). Syntypes MCZ 24879.

zigzac, Helicina Plate 5, Figure 8
1868b, AJC **3:** 229 (Oualan [Island]). Lectotype, here selected, ANSP 14485 is the measured type, *teste* Baker (1964: 163); three paralectotypes ANSP 359504; paralectotypes MCZ 297924.

The taxa for which no type material was located has been extracted from the preceding alphabetical list and arranged here according to publications and dates.

Proceedings of the Zoological Society of London

nebulosa, Borsonia: 1860b, PZS **28:** 143 (Sandwich Islands)
pallida, Mitra: 1860b, PZS **28:** 146 (Sandwich Islands)
oryza, Marginella: 1860b, PZS **28:** 147 (Sandwich Islands)
maculosa, Daphnella: 1860b, PZS **28:** 148 (Sandwich Islands)
sculpta, Nucula: 1860b, PZS **28:** 189 (Corea [Korea] Sea)
luteostoma, Ranella: 1861a, PZS **28:** 397 (Sandwich Islands)
neglectus, Conus: 1861a, PZS **28:** 398 (Sandwich Islands)
cancellata, Coralliobia: 1861a, PZS **28:** 399 (Sandwich Islands); "Only a single dead specimen found."
lineata, Columbella: 1861a, PZS **28:** 399 (Sandwich Islands)
costellifera, Anachis: 1863d, PZS for 1862: 279 (Pacific Islands)
ovata, Hydrocena: 1865a, PZS for 1864: 674 [Mangaia Island]
sculptilis, Coralliobia: 1865d, PZS for 1865: 513 (Islands of the Central Pacific)
conica, Torinia: 1865d, PZS for 1865: 514 (Islands of the Central Pacific)
multiplicata, Mitroidea: 1865d, PZS for 1865: 514 (Islands of the Central Pacific)
punctatus, Triphoris: 1871a, PZS for 1870: 775 (Annaa Island)
cylindricus, Triphoris: 1871a, PZS for 1870: 776 (Apaiang Island)
filicostata, Pitys: 1871d, PZS for 1871 (Kauai)
simplaria, Vertigo: 1871d, PZS for 1871: 461 (Marquesas Islands)
bacca, Vertigo: 1871d, PZS for 1871: 461 (Kalapana [Puna District] Hawaii)
costellifera, Truncatella: 1871d, PZS for 1871: 468 (Vavau [Island]; "Collected at the above locality by Mr. John Brazier"

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extensa, Leptachatina: 1870a, JdeC **18:** 92 (Kauai)
lucida, Leptachatina: 1870a, JdeC **18:** 93 (Kauai)
verecunda, Pithys: 1870c, JdeC **18:** 397 (Marquesas Islands)

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distans, Helix: 1866b, AJC **2:** 290 (Sandwich Islands)
flammulata, Mitra: 1868a, AJC **3:** 212 (Sandwich and Paumotus Islands)
sectilis, Mitra: 1868d, AJC **3:** 271 (Hawaii)
aurantium, Operculatum: 1868d, AJC **3:** 287 (Hawaii)
rosacea, Terebra: 1869d, AJC **5:** 65 (Oahu)
propinqua, Terebra: 1869d, AJC **5:** 66 (Hawaii)
lirata, Pleurotoma: 1869d, AJC **5:** 68 (Oahu)
monilifera, Pleurotoma: 1869d, AJC **5:** 68 (Oahu)
newcombii, Mitra: 1869d, AJC **5:** 69 (Oahu)
striata, Alcyna: 1869d, AJC **5:** 70 (Hawaii)
balteata, Rissoina: 1869d, AJC **5:** 72 (Hawaii)
sulcifera, Torinia: 1869d, AJC **5:** 79 (Kauai)
viridis, "?" Acanthochites: 1872d, AJC **7:** 194 (Kauai)

obesa, Partula: 1868b, AJC **3:** 223, pl. 15, fig. 12 (Hab?); "We have but a single specimen"
striata, Engina: 1868d, AJC **3:** 275, pl. 23, fig. 10 (Paumotus)
elongata, Volutella: 1868d, AJC **3:** 281, pl. 23, fig. 23 (Fanning Island)
semicostata, Rissoa: 1868d, AJC **3:** 296, pl. 24, fig. 32 (Caroline Islands)
nucea, Nassa: 1869d, AJC **5:** 70, pl. 8, fig. 7 (Caroline Islands)
tumida, Hyalopsis: 1871, AJC **7:** 27, pl. 9, fig. 6 (Solomon Islands)

ADDITIONAL OR CORRECTED LOCALITY DATA

This list was based essentially on the *National Geographic Atlas of the World* (6th ed., 1990), but also useful were the *Index to the Islands of the Pacific* by Brigham (1900), the *Hawaiian Gazetteer* by Coulter (1935), and *Pacific Island Names* by Motteler (1986).

Aitutake Island [Aitutaki Atoll, Hervey Group, Cook Islands]
Annaa Island [Anaa, Tuamotu Archipelago]
Apaian Island [Abaiang Island, Gilbert Islands, Kiribati]
Apaiang Island [Abaiang Island, Gilbert Islands, Kiribati]
Apiana Island [Abaiang Island, Gilbert Islands, Kiribati]
Ascension Island [Pohnpei, Caroline Islands]
Atiu Island [Hervey Group, Cook Islands]
Baker Island [0°13′30″N, 176°29′30″W]
Bolabola Island [Bora-Bora, Society Islands]
Ebon Island [Atoll, Marshall Islands]
Fanning Island [Tabuaeran, Kiribati; 3°51′25″N, 159°22′W]
Guam [Island, Mariana Islands]
Hauheine Island [Society Islands]
Hawaii [Island, Hawaiian Islands]
Howland Island [0°49′N, 176°40′W]
Huaheine Island [Society Islands]
Jarvis Island [Line Islands; 0°22′33″S, 159°54′11″W]
Kauai [Island, Hawaiian Islands]
Kingsmill Islands [Kingsmill Group, Gilbert Islands, Kiribati]
Lanai [Island, Hawaiian Islands]
Makaimo Island [Makemo Island, Tuamotu Archipelago]
Mangaia Island [Hervey Group, Cook Islands]
Mangia Island [Mangaia Island, Hervey Group, Cook Islands]
Maui [Island, Hawaiian Islands]
Molokai [Island, Hawaiian Islands]
Niihau [Island, Hawaiian Islands]
Niüe Island [south of the Samoa Islands; 19°S, 170°W]
Nukahiva [Nuku Hiva Island, Marquesas Islands]
Oahu [Island, Hawaiian Islands]
Oualan [Kusaie or Kosrae Island, Caroline Islands]
Paumotus [Tuamotu Archipelago]
Philip Island [south of Norfolk Island]
Ponape [Pohnpei Island, Caroline Islands]
Raiatea [Island, Society Islands]
Roratonga [Rarotonga Island, Hervey Group, Cook Islands]
Sandwich [Hawaiian Islands]
Tahaa [Island, Society Islands]
Tahiti [Island, Society Islands]
Tarawa [Island, Gilbert Islands, Kiribati]
Tutuila [Island, Samoa Islands]
Vavau [Island, Vava'u Group, Tonga Islands]
Viti [Fiji] Islands]

LITERATURE CITED

For the complete bibliography of Pease, see Clench (1975).

AUSTIN, Walter. 1921. James Walker Austin. Norwood, Massachusetts: Plimpton Press, Privately Printed. ix + 227 pp.

BAKER, H. B. 1963. Type land snails in the Academy of Natural Sciences of Philadelphia. Part II. Land Pulmonata, exclusive of North America north of Mexico. Proceedings of the Academy of Natural Sciences of Philadelphia, **115**(8): 191–259 (November).

———. 1964. Type land snails in the Academy of Natural Sciences of Philadelphia. Part III. Limnophile and Thalassophile Pulmonata. Part IV. Land and fresh-water Prosobranchia. Proceedings of the Academy of Natural Sciences of Philadelphia, **116**(4): 149–193 (October).

BRATCHER, T., AND W. CERNOHORSKY. 1987. Living Terebras of the World. Melbourne, Florida: American Malacologists. 240 pp.

BRIGHAM, W. T. 1900. Index to the islands of the Pacific Ocean. Memoirs of the B. P. Bishop Museum, **1**(2): 1–256 (December).

BRODIE, G. D., AND R. C. WILLAN. 1993. Redescription and taxonomic reappraisal of the tropical Indo-Pacific nudibranch *Siraius nucleola* (Pease, 1860) (Anthobranchia: Doridoidea: Dorididae). The Veliger, **36**(2): 124–133 (April).

BROT, A. 1872. Notice sur quelques espèces de Mélanies nouvelles ou imparfaitement connues. [*in*] Matériaux pour servir a l'étude de la famille des Mélaniens. **III:** 27–55, pls. 2–4.

———. 1877. [*in*] Martini and Chemnitz (Kuester's Edition). Systematisches Conchylien-Cabinet (2) **1:** pt. 24, Die Melaniaceen. Signature 264, pp. 273–352.

CATE, C. N. 1973. A systematic revision of the Recent Cypraeid family Ovulidae (Mollusca: Gastropoda). The Veliger, **15**(Suppl.): 116 pp., 51 pls. (January).

CERNOHORSKY, W. O. 1976. The Mitridae of the World. Part 1. The subfamily Mitrinae. Indo-

Pacific Mollusca, **3**(17): 273–528, pls. 248–466 (September).

———. 1984. Systematics of the family Nassariidae (Mollusca: Gastropoda). Bulletin of the Auckland Institute and Museum, **14:** 1–356, 51 pls., 173 figs. (July).

———. 1987. Type specimens of Pacific Mollusca described mainly by A. Garrett and W. Pease with description of a new *Morula* species (Mollusca: Gastropoda). Records of the Auckland Institute and Museum, **24:** 93–105 (December).

———. 1991. The Mitridae of the World. Part 2. The subfamily Mitrinae concluded and subfamilies Imbricariinae and Cylindromitrinae. Monographs of Marine Mollusca, (4): 1–164, 155 pls. (May).

CERNOHORSKY, W. O., AND T. BRATCHER. 1976. Notes on the taxonomy of Indo-Pacific Terebridae (Mollusca: Gastropoda), with description of a new species. Records of the Auckland Institute and Museum, **13:** 131–140, text figs. (December).

CLENCH, W. J. 1932. *Diplomorpha coxi* (Pease). Nautilus, **46**(2): 68–69 (October).

———. 1964. The genera *Pedipes* and *Laemodonta* in the Western Atlantic. Johnsonia, **4**(42): 117–128, pls. 76–79 (February).

———. 1975. Catalogue of species and bio-bibliography of William Harper Pease. See under: Kay, E. A., and W. J. Clench (1975).

———. 1979. A biography of Andrew Garrett, early naturalist of Polynesia: Part 2. Catalogue of molluscan species and bibliography. Nautilus, **93**(3): 96–102 (April).

CLENCH, W. J., AND R. D. TURNER. 1948. A catalogue of the family Truncatellidae with notes and descriptions of new species. Occasional Papers on Mollusks, **1**(13): 157–212, pls. 23–25 (June).

———. 1957. The family Cymatiidae in the Western Atlantic. Johnsonia, **3**(36): 189–244, pls. 110–135 (December).

COOKE, C. M. 1910, 1911. *Leptachatina*. Manual of Conchology, (2)**21**: 1–64, pls. 1–9 (July 1910); 65–92, pls. 10–16 (March 1911).

COOKE, C. M., AND Y. KONDO. 1960. Revision of Tornatellinidae and Achatinellidae (Gastropoda, Pulmonata). Bernice P. Bishop Museum, Bulletin, **221:** 303 pp. (December).

COULTER, J. W. 1935. A gazetteer of the territory of Hawaii. University of Hawaii, Research Publications, **11:** 241 pp.

CRAMPTON, H. E. 1916. Studies on the variation, distribution, and evolution of the genus *Partula*. The species inhabiting Tahiti. Carnegie Institution of Washington, Publication, **228:** 311 pp., 34 pls.

———. 1932. Studies on the variation, distribution, and evolution of the genus *Partula*. The species inhabiting Moorea. Carnegie Institution of Washington, Publication, **410:** vi + 335 pp., 24 pls.

CROSSE, H. 1876. Note complémentaire sur quelques espèces de Mollusques terrestres habitant l'île Kauai (îles Hawaii). Journal de Conchyliologie, **24:** 95–99, pls. 1, 3, 4 (January).

DALL, W. H. 1871. On the limpets; with special reference to the species of the West Coast of America, and to a more natural classification of the group. American Journal of Conchology, **6**(3): 227–282, pls. 14–17 (April).

DOHRN, H. 1863. Ueber *Tornatellina*. Malakozoologische Blätter, **10:** 156–162 (August).

DUSHANE, H. 1988. Hawaiian Epitoniidae. Hawaiian Shell News, **36**(4): 1, 7 (April); (5): 9–10 (May); (7): 4–5 (July); (9): 4–5 (September); (10): 5 (October).

———. 1990. Hawaiian Epitoniidae. Hawaiian Shell News, **38**(Suppl. 1): 17 pp. (January).

FISCHER-PIETTE, E. 1950. Liste des types décrits dans le Journal de Conchyliologie et conservés dans la collection de ce journal. Journal de Conchyliologie, **90**(1): 8–23, pl. 1 (January); **90**(2): 65–82, pls. 2–4 (April).

GARRETT, A. 1879. Annotated catalogue of the species of Cypraeidae collected in the S. Sea Islands. Journal of Conchology, **2**(4): 105–128 (April).

———. 1881. The terrestrial Mollusca inhabiting the Cook's or Hervey Islands. Journal of the Academy of Natural Sciences of Philadelphia, (2) **8:** 381–411 (March).

———. 1884. The terrestrial Mollusca inhabiting the Society Islands. Journal of the Academy of Natural Sciences of Philadelphia, (2) **9:** 17–114, pls. 2, 3 (July).

———. 1887. On the terrestrial mollusks of the Viti Islands. Proceedings of the Zoological Society of London for 1867, pp. 284–316.

GREENE, K. W. 1960. William Harper Pease—100 years later. Hawaiian Shell News, **8**(6): 1, 4, 5 (April); Pease's catalogue of books on Hawaii. *Ibid.* **8**(7): 4, 5 (May); W. H. Pease's library—some facts—some theories. *Ibid.* **8**(8): 1, 3, 4, 8 (June); William Harper Pease—his 21 years in Hawaii. *Ibid.* **8**(9): 5, 8 (July); W. H. Pease—his last few years and death at 47. *Ibid.* **8**(10): 5, 8 (August); William Harper Pease and his interest in land shells. *Ibid.* **8**(11): 5, 8 (September); William Harper Pease and his interest in marine shells. *Ibid.* **8**(12): 5, 6, 8 (October).

HARTMAN, W. D. 1881. Observations on the species of the genus *Partula* Fér. with a bibliographic catalogue. Observations on the duplicates of the genus *Partula* Fér. contained in the Museum of Comparative Zoology, Cambridge, Mass., formerly belonging to the collection of the late William H. Pease. Bulletin of the Museum of Comparative Zoology, **9**(5): 171–196, 2 maps (November).

———. 1886. New species of *Partula* from the New Hebrides and Solomon Islands. Proceedings of the Academy of Natural Sciences of Philadelphia, **38:** 30–35, pl. 2 (April).

HOUBRICK, R. S. 1992. Monograph of the genus *Cerithium* Bruguière in the Indo-Pacific (Cerithidae: Prosobranchia). Smithsonian Contributions to Zoology, **510:** iv + 211 pp., 145 figs.

HYATT, A., AND H. A. PILSBRY. 1911. Amastrinae. Manual of Conchology, (2) **21:** 93–387, pls. 14–56 (March–December).

KAY, E. A. 1965. Marine molluscs in the Cuming collection, British Museum (Natural History) described by William Harper Pease. Bulletin of the British Museum (Natural History), Zoology, Supplement 1, 96 pp., 14 pls.

KAY, E. A., AND W. J. CLENCH. 1975. A biobibliography of William Harper Pease, Malacologist of Polynesia. Part 1. A biography of William Harper Pease by E. A. Kay, pp. 1–21; Part 2. Catalogue of species and bibliography of William Harper Pease by W. J. Clench, pp. 22–50. Nemouria, Occasional Papers of the Delaware Museum of Natural History, **16:** 1–50 (December).

KILIAS, R. 1969. Die typen und typoide der Mollusken-Sammlung des Zoologischen Museums in Berlin (5). Mitteilungen aus dem Zoologischen Museum in Berlin, **45**(2): 245–258, 2 figs.

KORN, A. 1958. The Victorian Visitors. Honolulu: University of Hawaii Press.

MARTENS, E. VON, AND B. LANGKAVEL. 1871. Donum Bismarckianum. Eine sammlung von Südsee-Conchylien. Berlin: Verlag von Ferdinand Berggold. vi + 74 pp., 4 col. pls. (Originally published as a University "Program" earlier in 1871 with the title Beschreibung von Südseeconchylien des Donum Bismarckianum von Dr. Langkavel. This edition consisted of 36 pages only, of which pp. 1–24 are identical to those of the v. Martens and Langkavel edition (74 pp.). Each edition has the same 4 colored plates.)

MOTTELER, L. S. 1986. Pacific Island Names. Bishop Museum Miscellaneous Publication, **34:** [vii] + 91 pp.

MYERS, B. W., AND A. D'ATTILIO. 1989. A new *Favartia* Jousseaume, 1880 from the Western Pacific and a lectotype designated for *Murex foveolatus* Pease, 1869 = *Murex peasei* Tryon, 1880. Venus, The Japanese Journal of Malacology, **48**(3): 154–160, figs. 1–12 (October).

NEVILL, G. 1878. Hand List of Mollusca in the Indian Museum, Calcutta. Part I. Gastropoda. xv + 338 pp.

———. 1884. Hand List of Mollusca in the Indian Museum, Calcutta. Part II. Gastropoda. x + 306 pp.

PACE, S. 1902. Contributions to the study of the Columbellidae. Proceedings of the Malacological Society of London, **5**(1): 36–112 (April); (2): 113–154 (July).

PAETEL, FR. 1873. Catalog der Conchylien-Sammlung. Berlin: Verlag von Gebrüder Paetel. 172 pp.

———. 1887, 1888. Catalog der Conchylien-Sammlung. Berlin: Verlag von Gebrüder Paetel, **1**(1–6): 1–480, 1887; (7, 8): 481–638, 1888.

PEASE, W. H. 1860a. Descriptions of new species of Mollusca from the Sandwich Islands. Proceedings of the Zoological Society of London, **28:** 18–36 (February–May).

———. 1860b. Descriptions of new species of Mollusca from the Sandwich Islands. (Part II). Proceedings of the Zoological Society of London, **28:** 141–148 (February–May).

———. 1860c. Descriptions of three species of marine shells from the Pacific Ocean. Proceedings of the Zoological Society of London, **28:** 189–190 (February–May).

———. 1861a. Descriptions of seventeen new species of marine shells, from the Sandwich Islands, in the collection of Hugh Cuming. Proceedings of the Zoological Society of London, **28:** 397–400 (August 1860–March 1861).

———. 1861b. Descriptions of forty-seven new species of shells from the Sandwich Islands, in the collection of Hugh Cuming. Proceedings of the Zoological Society of London, **28:** 431–438 (August 1860–March 1861).

———. 1861c. Descriptions of six new species of land shells, from the Island of Ebon, Marshall's group, in the collection of H. Cuming. Proceedings of the Zoological Society of London, **28:** 439–440 (August 1860–March 1861).

———. 1861d. Descriptions of new species of Mollusca from the Pacific Islands. Proceedings of the Zoological Society of London for 1861, pp. 242–247 (September).

———. 1862a. Descriptions of two new species of *Helicter* (*Achatinella*, Swains.), from the Sandwich Islands, with a history of the genus. Proceedings of the Zoological Society of London for 1862, pp. 3–7 (June).

———. 1862b. Catalogue des espèces de *Rissoina* des îles Sandwich et description d'une espèce nouvelle. Journal de Conchyliologie, **10:** 381–383, pl. 13 (October).

———. 1863a. Description of a new genus of marine shells from the Sandwich Islands. Proceedings of the Zoological Society of London for 1862, p. 240 (April).

———. 1863b. Descriptions of new species of marine shells from the Pacific Islands. Proceedings of the Zoological Society of London for 1862, pp. 240–243 (April).

———. 1863c. Descriptions of new species of shells from the Pacific Islands. Proceedings of the Zoological Society of London for 1862, pp. 243–245 (April).

———. 1863d. Descriptions of new species of marine shells from Pacific Islands. Proceedings of the Zoological Society of London for 1862, pp. 278–280 (April).

———. 1864. On errors and omissions in former communications. Proceedings of the Zoological Society of London for 1863, p. 510 (April).

———. 1865a. Descriptions of new species of land shells from the Islands of the Central Pacific. Proceedings of the Zoological Society of London for 1864, pp. 668–676 [p. 676 misprinted as 766] (May).

———. 1865b. Remarks on the species of *Succinea* inhabiting the Tahitian Archipelago, with description of a new species. Proceedings of the Zoological Society of London for 1864, pp. 676–677 (May).

———. 1865c. Description of a new species of *Latirus,* and remarks on others, inhabiting the Pacific Islands. Proceedings of the Zoological Society of London for 1865, pp. 53–54 (June).

———. 1865d. Descriptions of new genera and species of marine shells from the Islands of the Central Pacific. Proceedings of the Zoological Society of London for 1865, pp. 512–517 (October).

———. 1865e. Descriptions of new species of *Phaneropneumona,* inhabiting Polynesia. American Journal of Conchology, **1**(4): 287–291 (October).

———. 1866a. Descriptions of new species of *Partula,* inhabiting the Tahitian Archipelago. American Journal of Conchology, **2**(3): 193–203 (July).

———. 1866b. Descriptions of new species of land shells, inhabiting Polynesia. American Journal of Conchology, **2**(4): 289–293 (July).

———. 1867a. Illustrations of new species of *Partula.* American Journal of Conchology, **3**(1): 81, pl. 1 (April).

———. 1867b. [*under*] Scientific Intelligence. American Journal of Conchology, **3**(1): 104 (April).

———. 1868a. Descriptions of marine Gasteropodae, inhabiting Polynesia. American Journal of Conchology, **3**(3): 211–222, pl. 15 (January).

———. 1868b. Descriptions of new species of land shells, inhabiting Polynesia. American Journal of Conchology, **3**(3): 223–230 (January).

———. 1868c. Notes on the remarks of Dr. P. P. Carpenter (Published in Proc. Zool. Soc. Lond., 1865) on certain species of marine Gastropoda, named by W. Harper Pease. American Journal of Conchology, **3**(3): 231–234 (January).

———. 1868d. Descriptions of sixty-five new species of marine Gasteropodae, inhabiting Polynesia. American Journal of Conchology, **3**(4): 271–297, pls. 23, 24 (April).

———. 1868e. Descriptions of marine Gasteropodae, inhabiting Polynesia. American Journal of Conchology, **4**(2): 71–80, pls. 7–10 (October).

———. 1868f. Descriptions d'espèces nouvelles d'*Auriculella,* provenant des îles Hawaï. Journal de Conchyliologie, **16:**342–347, pl. 14 (October).

———. 1868g. Descriptions of marine Gasteropodae, inhabiting Polynesia. American Journal of Conchology, **4**(3): 91–102, pls. 11, 12 (November).

———. 1868h. Synonymy of marine Gasteropodae inhabiting Polynesia. American Journal of Conchology, **4**(3): 103–132 (November).

———. 1868i. Description of a new species of genus *Latirus,* Montf. American Journal of Conchology, **4**(3): 152 (November).

———. 1868j. Description of a new genus and eleven species of land shells, inhabiting Polynesia. American Journal of Conchology, **4**(3): 153–160, pl. 12 (November).

———. 1869a. Monographie de la famille des Realiea, Pfeiffer. Journal de Conchyliologie, **17:** 131–160 (April).

———. 1869b. Liste des espèces supposées appartenir au genre *Assiminea* de Leach. Journal de Conchyliologie, **17:** 161–167, pl. 7 (April).

———. 1869c. Description d'espèces nouvelles du genre *Helicter,* habitant les îles Hawaii. Journal de Conchyliologie, **17:** 167–176 (April).

———. 1869d. Descriptions of new species of marine Gasteropodae inhabiting Polynesia. American Journal of Conchology, **5**(2): 64–79, pl. 8 (October).

———. 1869e. Remarks on marine Gastropodae inhabiting the West Coast of America; with descriptions of two new species. American Journal of Conchology, **5**(2): 80–84 (October).

———. 1869f. Corrections and additions to "Synonomy of Marine Gasteropodae inhabiting Polynesia." American Journal of Conchology, **5**(2): 85–87 (October).

———. 1869g. On the classification of the *Helicterinae.* Proceedings of the Zoological Society of London for 1869, pp. 644–652 (December).

———. 1870a. Observations sur les espèces de coquilles terrestres qui habitent (*sic*) l'île Kauai (îles Hawaii) accompagnées de descriptions d'espèces nouvelles. Journal de Conchyliologie, **18:** 87–97 (January).

———. 1870b. Remarks on the species of *Melania* and *Limnaea* inhabiting the Hawaiian Islands, with descriptions of new species. American Journal of Conchology, **6**(1): 4–7, pl. 3 (July).

———. 1870c. Remarques sur certaines espèces de coquilles terrestres, habitant la Polynésie, et description d'espèces nouvelles. Journal de Conchyliologie, **18:** 393–403 (October).

———. 1871a. Remarks on the genus *Triphoris* (Desh.), with descriptions of new species. Proceedings of the Zoological Society of London for 1870, pp. 773–777 (April).

———. 1871b. Synonymie de quelques genres et espèces de coquilles terrestres habitant la Polynésie. Journal de Conchyliologie, **19:** 92–97 (April).

———. 1871c. Remarques sur le genre *Dibaphus* et sur quelques espèces du genre *Conus.* Journal de Conchyliologie, **19:** 98–100 (April).

———. 1871d. Catalogue of the land-shells inhabiting Polynesia, with remarks on their synonymy, distribution, and variation, and descriptions of new genera and species. Proceedings of the Zoological Society of London for 1871, pp. 449–477 (August).

———. 1871e. Notes on the synonymy and distribution of marine Gastropoda. American Journal of Conchology **7**(1): 20–25 (August).

———. 1871f. Descriptions of new species of land shells. American Journal of Conchology, **7**(1): 26–27, pl. 9 (August).

———. 1872a. Polynesian Chitonidae. American Journal of Conchology, **7**(3): 194–195 (March).

———. 1872b. Descriptions of four species of land shells inhabiting the Papuan Islands. American Journal of Conchology, **7**(3): 196–197 (March).

———. 1872c. Synonymy of *Patella exarata*, Rve. American Journal of Conchology, **7**(3): 198–200 (March).

PILSBRY, H. A. 1895. Bullidae. Manual of Conchology, (1) **15:** 326–436, pls. 34–43 (February).

———. 1896. *Trochomorpha fuscata* Pease. Nautilus, **9**(10): 120 (February).

———. 1909, 1910. Partulidae. Manual of Conchology, (2) **20:** 155–314, pls. 22–36 (September 1909); 315–336, pls. 37–43 (February 1910).

———. 1917. Marine mollusks of Hawaii, I–III. Proceedings of the Academy of Natural Sciences of Philadelphia, **69:** 207–230, pls. 14, 15 (August).

PILSBRY, H. A., AND C. M. COOKE. 1914–16. Appendix to Amastridae. Tornatellinidae. Manual of Conchology, (2) **23:** 1–48, pls. 1–13 (October 1914); 49–128, pls. 14–23 (August 1915); 129–256, pls. 24–38 (December 1915); 257–302, pls. 39–55 (February 1916).

———. 1920. *Lyropupa* and *Nesopupa*. Manual of Conchology, (2) **25:** 226–277, pls. 19–24; 322–392, pls. 30–34 (April).

———. 1922. The identity of *Helix depressiformis* and *H. prostrata* Pease. Nautilus, **36**(1): 17 (July).

———. 1926. *Lyropupa*. Manual of Conchology, (2) **27:** 223–266, pls. 28–32 (March).

PILSBRY, H. A., AND H. N. LOWE. 1932. West Mexican and Central American mollusks collected by H. N. Lowe, 1929–31. Proceedings of the Academy of Natural Sciences of Philadelphia, **84:** 33–144, pls. 1–17 (May).

PONDER, W. F., AND R. DE KEYZER. 1992. A revision of the genus *Diala* (Gastropoda: Cerithiodea: Dialidae). Invertebrate Taxonomy, **6**(4): 1019–1075.

PRUVOT-FOL, A. 1947. Les Opisthobranches de W. Harper Pease révision. Journal de Conchyliologie, **87:** 96–114 (June).

REEVE, L. A., AND G. B. SOWERBY. 1843–78. Conchologia Iconica, Vols. 1–20, 2727 pls. and letterpress. London.

ROBERTSON, R., I. RICHARDSON, G. M. DAVIS, AND A. E. BOGAN. 1981. Catalog of the types of Neontological mollusca of the Academy of Natural Sciences of Philadelphia. Part 2. Gastropoda: Archaeogastropoda: Pleurotomariacea, Fissurellacea, Patellacea. Tryonia, (5): 1–47 (December).

SCHMELTZ, J. D. E. 1874. Museum Godeffroy, Catalog V. Hamburg: L. Friederichsen & Co. xxxvi + 215 pp. (February).

SMITH, H. H. 1902. An annotated catalogue of the shells of the genus *Partula* in the Hartman collection belonging to the Carnegie Museum. Annals of the Carnegie Museum, **1**(3): 422–485 (March); [pp. 580–582, Index].

SOLEM, A. 1976. Endodontoid Land Snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra): Part I. Family Endodontidae. Chicago: Field Museum of Natural History. xii + 508 pp. (October).

———. 1983. Endodontoid Land Snails from Pacific Islands (Mollusca: Pulmonata: Sigmurethra): Part II. Families Punctidae and Charopidae, Zoogeography. Chicago: Field Museum of Natural History. ix + 336 pp. (January).

SOWERBY, G. B. 1842–82. Thesaurus Conchyliorum, Vols. 1–5. London.

THOMAS, W. S. 1979. A biography of Andrew Garrett, early naturalist of Polynesia: Part 1. Nautilus, **93**(1): 15–28 (January).

TRYON, G. W. 1866a. Note on Mr. Pease's species of Polynesian Phaneropneumona. American Journal of Conchology, **2**(1): 82, pl. 5 (January).

———. 1866b. Descriptions of new species of Melaniidae and Melanopisdae. American Journal of Conchology, **2**(4): 299–301, pl. 20 (October).

———. 1872. Remarks on the genus *Triphoris* (Desh.) with descriptions of new species. W. Harper Pease. American Journal of Conchology, **7**(3): 206 (March).

———. 1880. Muricinae. Manual of Conchology, (1) **2**(3): 129–192 (July).

———. 1883. Columbellidae. Manual of Conchology, (1) **5**(2): 100–128, pls. 42–49 (March).

———. 1884. Pleurotomidae. Manual of Conchology, (1) **6**(3): 151–214 (June); 215–413, pls. 1–34 (October).

———. 1885. Terebridae. Manual of Conchology, (1) **7**(1): 1–64 (January).

———. 1886. Naticidae. Manual of Conchology, (1) **8**(1): 1–64, pls. 1–26 (January).

TUDGE, C. 1992. Last stand for Society snails. New Scientist, **1829:** 25–29 (July).

TURNER, R. D. 1946. John Gould Anthony with a bibliography and catalogue of his species. Occasional Papers on Mollusks, **1**(8): 81–108 (July).

WARÉN, A. 1980. Descriptions of new taxa of Eulimidae (Mollusca, Prosobranchia), with notes on some previously described genera. Zoologica Scripta, **9**(4): 283–306.

ZILCH, A. 1962. Die typen und typoide des Natur-Museums Senckenberg, 26: Mollusca, Achatinellacea. Archiv für Molluskenkunde, **91**(1–3): 77–94, pls. 2, 3 (June).

INDEX

This index lists all of the names introduced by Pease included in the catalog by Clench (1975) as well as those mistakenly attributed to him by other authors. Here the species are placed under the original genera in which they were included. References to all of the numbered *notes* and *notes additionalles* made on the opisthobranch species studied by Pruvot-Fol (1947: 107–114) are included in this index, but only those mentioned by Kay (1965) or those that had shells, and were subsequently located, are mentioned in the preceding list of taxa.

All taxa for which type material is extant is indicated here by **. A single * indicates that either no type material was located or that the taxon was included for some other reason such as a replacement for a preoccupied one. No * indicates that the taxa are opisthobranchs that occur only in the Clench list; several taxa followed by C were not in the latter's list.

The following names mentioned here are not listed by Clench: *Amastra rugulosa similaris*, *Helix fratercula*, *Melania newcombii*, *Melania oualaensis*, *Melania valanensis*, *Partula approximata*, and *Partula microstoma*.

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Figure 1. "?" *Acanthochites armatus* Pease. [Pauloa] Oahu [Hawaiian Islands]. Holotype MCZ 73452. Length 10 mm, width 6 mm.

Figure 2. *Pinna trigonalis* Pease. Kingsmill Islands [Kiribati]. Lectotype MCZ 225951. Length 217 mm, width 94 mm.

Figure 3. *Avicula brunnea* Pease. [Molokai] Sandwich [Hawaiian] Islands. Lectotype MCZ 298465. Length 141 mm, width 73 mm.

Figure 4. *Avicula radiata* Pease. Kingsmill Islands [Kiribati]. Lectotype MCZ 298466. Length 84.5 mm, width 42 mm.

Figure 5. *Siphonaria depressa* Pease. Apaiang [Abaiang] Island [Kiribati]. Lectotype ANSP 22199. Length 18 mm, width 14 mm, height 3 mm.

Figure 6. *Tectura conoidalis* Pease. Roratonga [Rarotonga Island, Cook Islands] labeled as from the Paumotus. Lectotype MCZ 302558. Length 18 mm, width 14 mm, height 7 mm.

Figure 7. *Tectura tahitensis* Pease. Tahiti [Society Islands]. Lectotype ANSP 38949. Length 38 mm, width 12 mm, height 3.5 mm.

Figure 8. *Patella sandwicensis* Pease. Sandwich [Hawaiian] Islands. Lectotype MCZ 304058. Length 37 mm, width 30 mm, height 18.5 mm.

Figure 9. *Scutellina aculeata* Pease. Hawaii [Hawaiian Islands]. Lectotype MCZ 83720. Length 4.5 mm, width 4 mm, height 3.4 mm.

Figure 10. *Scutellina compressa* Pease. Tahiti [Society Islands]. Lectotype MCZ 302552. Length 4 mm, width 1.5 mm, height 1.4 mm.

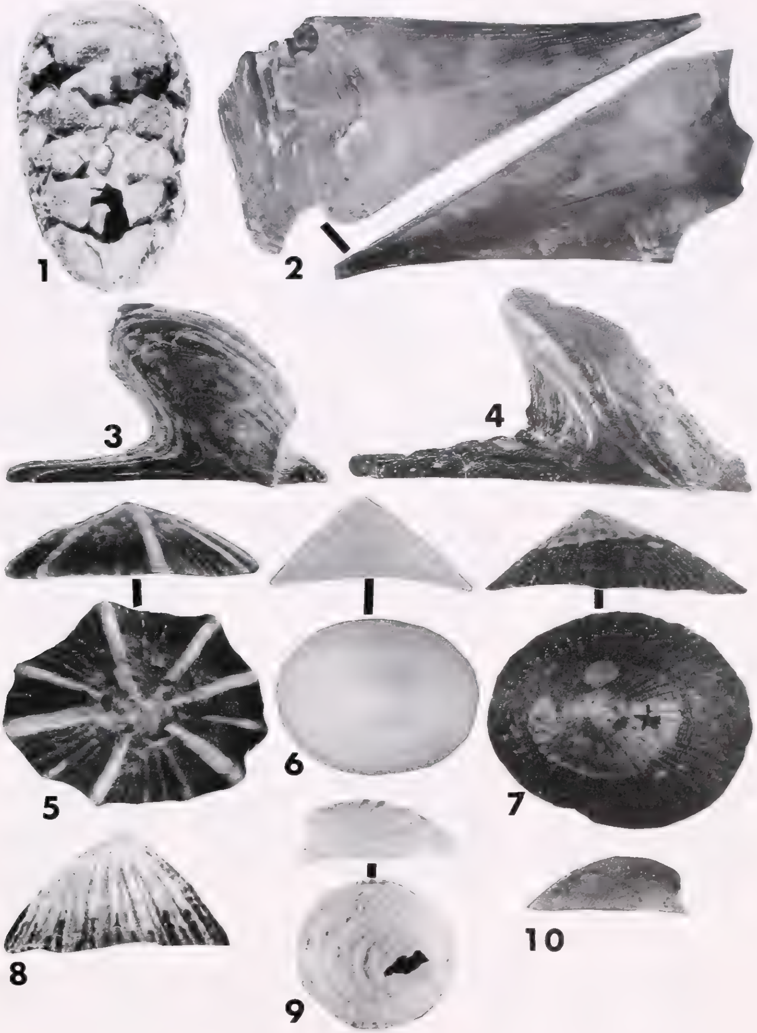
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Plate 1

Plate 2

Figure 1. *Helix capillata* Pease. Kauai, Sandwich [Hawaiian] Islands. Lectotype ANSP 1975a. Width 4 mm, height 2 mm.

Figure 2. *Helix striolata* Pease. Ebon Island [Atoll], Marshall [Islands]. Lectotype MCZ 11563. Width 3 mm, height 2 mm.

Figure 3. *Helicina pacifica* Pease. Oualan [Kusaie or Kosrae Island, Caroline Islands]. Lectotype ANSP 14443. Width 6 mm, height 4 mm.

Figure 4. *Helix congrua* Pease. Ponape [Pohnpei Island, Caroline Islands]. Lectotype MCZ 12161. Width 11.5 mm, height 8.5 mm.

Figure 5. *Trochomorpha trochiformis pallens* Pease. Moorea [Society Islands]. Lectotype MCZ 12188. Width 18 mm, height 12 mm.

Figure 6. *Trochomorpha nigritella oppressa* Pease. Ponape [Pohnpei Island, Caroline Islands]. Lectotype MCZ 12187. Width 15 mm, height 8.5 mm.

Figure 7. *Pithys paucicostata* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 17271. Width 3.5 mm, height 2 mm.

Figure 8. *Pithys atiensis* Pease. Atiu [Island, Cook Islands]. Lectotype MCZ 17335. Width 3 mm, height 1.5 mm.

Figure 9. *Auriculella triplicata* Pease. Oahu [Hawaiian Islands]. Lectotype MCZ 45150. Width 5 mm, height 10 mm.

Figure 10. *Auriculella ambusta* Pease. [Waianae Mountains, Oahu, Hawaiian Islands]. Lectotype MCZ 45152. Width 5 mm, height 8.5 mm.

Figure 11. *Amastra rugulosa similaris* Pease. [Waimea] Kauai [Hawaiian Islands]. Lectotype MCZ 45253. Width 8 mm, height 13.5 mm.

Figure 12. *Bulimus* (''?'' *Borus*) *coxi* Pease. [New Hebrides Islands]. Holotype MCZ 86495. Width 15 mm, length 25 mm.

Figure 13. *Cyclostoma biangulatum* Pease. Aitutaki [Atoll], Cook Islands. Lectotype MCZ 141031. Width 2 mm, height 3 mm.

Figure 14. *Carelia olivacea* Pease. Kauai [Hawaiian Islands]. Holotype MCZ 57114. Width 18 mm, height 41 mm. It is assumed that of the original measurements given by Pease—width 19 mm, height 69 mm—the latter is a misprint.

Figure 15. *Cyclostoma parvum* Pease. [Tahiti, Society Islands]. Lectotype MCZ 74949. Width 2 mm, height 2.5 mm.

Figure 16. *Lamellina laevis* Pease. Hervey Islands [Cook Islands]. Lectotype MCZ 154942. Width 1.5 mm, height 3.15 mm.

Figure 17. *Lamellina serrata* Pease. Ebon Island [Atoll], Marshall [Islands]. Lectotype MCZ 302555. Width 1.5 mm, height 3 mm.

Figure 18. *Tornatellina aperta* Pease. Tahiti [Society Islands]. Lectotype MCZ 175722. Width 2.5 mm, height 3 mm.

Figure 19. *Chondrella striata* Pease. Roratonga [Rarotonga Island, Cook Islands]. Lectotype MCZ 187917. Width 1.5 mm, height 2 mm.

Figure 20. *Vertigo costata* Pease. [Kona] Hawaii [Hawaiian Islands]. Holotype MCZ 45238. Width 1 mm, height 2 mm.

Figure 21. *Vertigo nitens* Pease. Ebon Island [Atoll], Marshall [Islands]. Lectotype MCZ 151650. Width 1 mm, height 2 mm.

Figure 22. *Vertigo costulosa* Pease. Hawaii [Hawaiian Islands]. Lectotype MCZ 45244. Width 1 mm, height 1.5 mm.

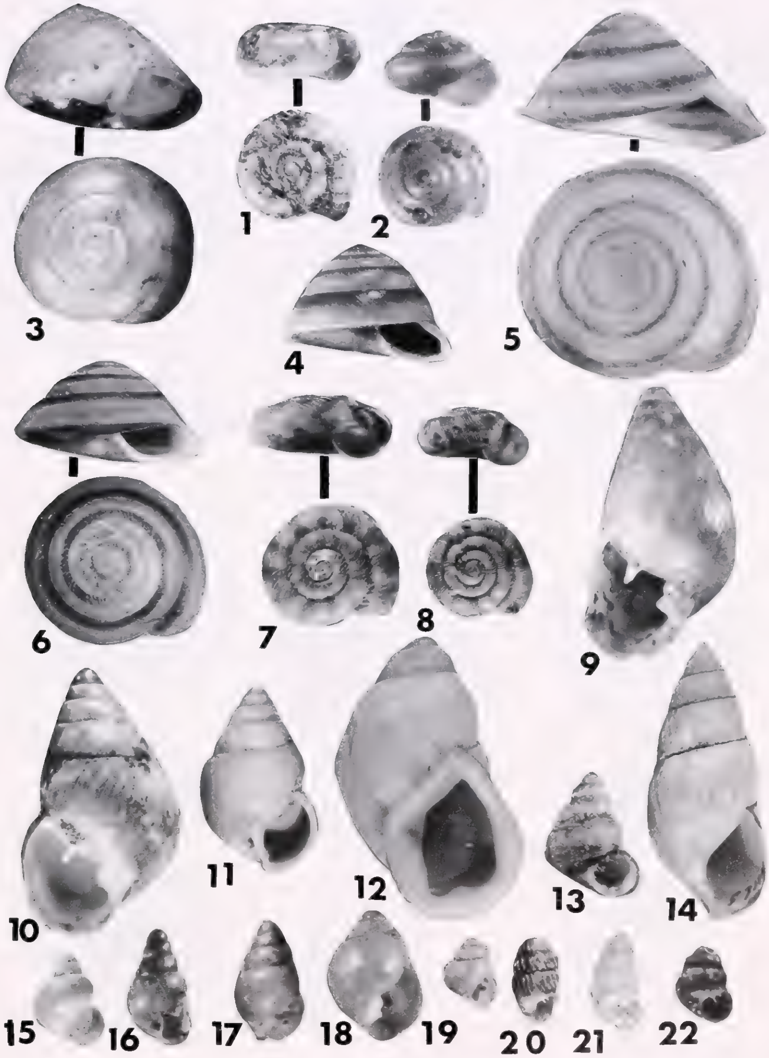
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Plate 2

Plate 3

Figure 1. *Helix depressiformis* Pease. Tahiti [Society Islands]. Lectotype MCZ 17342. Width 7 mm, height 2.5 mm.

Figure 2. *Helix fabrefacta* Pease. [Raiatea, Society Islands]. Lectotype MCZ 17238. Width 8 mm, height 4 mm.

Figure 3. *Helix rugata* Pease. Maui [Hawaiian Islands]. Lectotype MCZ 17237. Width 5 mm, height 3 mm.

Figure 4. *Helix laminata* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 17233. Width 7 mm, height 2.5 mm.

Figure 5. *Helix marquesana* Pease. Marquesas [Islands]. Lectotype MCZ 302557. Width 10 mm, height 7.5 mm.

Figure 6. *Helix conula* Pease. Tahiti [Society Islands]. Lectotype MCZ 297945. Width 6.5 mm, height 5 mm.

Figure 7. *Helix verticillata* Pease. Moorea [Society Islands]. Holotype ANSP 49284. Width 5 mm, height 3 mm.

Figure 8. *Helix oualanensis* Pease. Oualan [Kusaie or Kosrae Island, Caroline Islands]. Lectotype ANSP 47763. Width 5.5 mm, height 2 mm.

Figure 9. *Helix normalis* Pease. Moorea [Society Islands]. Lectotype MCZ 11543. Width 4.5 mm, height 3 mm.

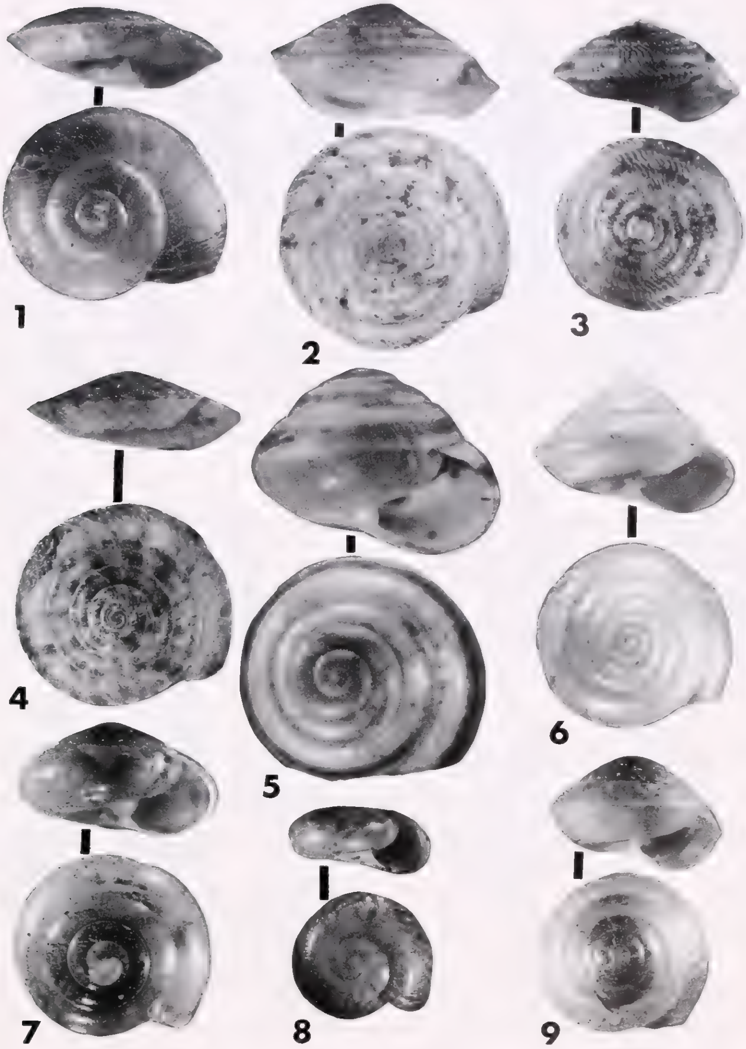

Plate 3

Plate 4

Figure 1. *Helicter proximus* Pease. Molokai [Hawaiian Islands]. Lectotype MCZ 25823. Width 15 mm, height 29 mm.

Figure 2. *Helicter hutchinsonii* Pease. Maui [Hawaiian Islands]. Lectotype MCZ 45254. Width 7 mm, height 16 mm.

Figure 3. *Registoma complanatum* Pease. Ebon Island [Atoll], Marshall [Islands]. Lectotype MCZ 141018. Width 3 mm, height 6 mm.

Figure 4. *Omphalotropis nebulosa* Pease. [Makela = San Cristobal Island] Solomon Islands. Lectotype MCZ 72347. Width 5.5 mm, height 9 mm.

Figure 5. *Labiella compacta* Pease. [Palauea] Maui [Hawaiian Islands]. Lectotype MCZ 45196. Width 4.5 mm, height 9 mm.

Figure 6. *Tornatellina oblonga* Pease. Tahiti [Society Islands]. Lectotype MCZ 154941. Width 1.5 mm, height 3 mm.

Figure 7. *Tornatellina nitida* Pease. Ebon Island [Atoll], Marshall [Islands]. Lectotype MCZ 28921. Width 2 mm, height 4 mm.

Figure 8. *Tornatellina simplex* Pease. Tahaa [Island, Society Islands]. Lectotype MCZ 175745. Width 2 mm, height 3 mm.

Figure 9. *Tornatellina dentata* Pease. Hawaii [Hawaiian Islands]. Lectotype MCZ 28918. Width 1 mm, height 2.5 mm.

Figure 10. *Tornatellina gracilis* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 302554. Width 1.5 mm, height 4 mm.

Figure 11. *Limnaea turgidula* Pease. Oahu [Hawaiian Islands]. Lectotype MCZ 298901. Width 8 mm, height 14.5 mm.

Figure 12. *Succinea mammillata* Pease. Nukahiva [Nuku Hiva, Marquesas Islands]. Lectotype MCZ 155145. Width 7.5 mm, height 12.5 mm.

Figure 13. *Succinea rubella* Pease. Lanai [Hawaiian Islands]. Lectotype MCZ 161671. Width 7.5 mm, height 11.5 mm.

Figure 14. *Succinea elongata* Pease. Kauai [Hawaiian Islands]. Holotype MCZ 161665. Width 9 mm, height 15.5 mm.

Figure 15. *Succinea costulosa* Pease. Tahiti [Society Islands]. Lectotype MCZ 31406. Width 5 mm, height 7 mm.

Figure 16. *Succinea labiata* Pease. Raiatea [Society Islands]. Lectotype MCZ 298909. Width 12 mm, height 19.5 mm.

Figure 17. *Haminea aperta* Pease. Tahiti [Society Islands]. Lectotype ANSP 57575. Width 11 mm, height 15 mm.

Figure 18. *Lobiger viridis* Pease. Tahiti [Society Islands]. Lectotype MCZ 297869. Width 8 mm, height 12 mm.

Figure 19. *Melania contigua* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 74887. Width 10 mm, height 20 mm.

Figure 20. *Melania oualanensis* 'Pease' Tryon. Oualan [Kusaie or Kosrae Island, Caroline Islands]. Lectotype ANSP 26274. Width 12 mm, height 29 mm.

Figure 21. *Catinella rubida* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 45252. Width 9 mm, height 11 mm.

Figure 22. *Melampus lucidus* Pease. [Honolulu] Oahu [Hawaiian Islands]. Lectotype ANSP 22284. Width 3.5 mm, height 5 mm.

Figure 23. *Haminea ovalis* Pease. Tahiti [Society Islands]. Lectotype MCZ 297877. Width 8 mm, height 10 mm.

Figure 24. *Haminea simillima* Pease. Tahiti [Society Islands]. Lectotype MCZ 297875. Width 8 mm, height 10 mm.

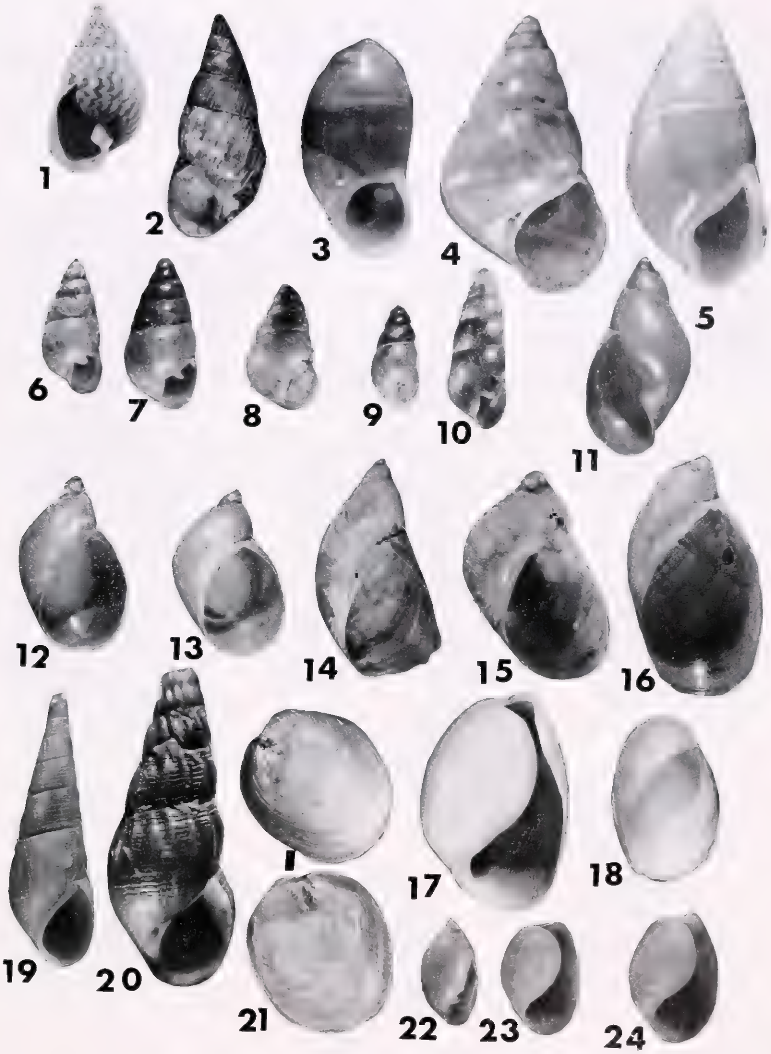
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Plate 4

Plate 5

Figure 1. *Scutellina granocostata* Pease. Hawaii [Hawaiian Islands]. Lectotype MCZ 83723. Width 6 mm, length 8 mm, height 3 mm.

Figure 2. *Libratula plana* Pease. Islands of the Central Pacific. Lectotype MCZ 119162. Width 3 mm, length 7 mm, height 1 mm.

Figure 3. *Helicina solida* Pease. [Tahiti, Society Islands]. Lectotype MCZ 297923. Width 8 mm, height 5 mm.

Figure 4. *Helicina corrugata* Pease. Raiatea [Society Islands]. Lectotype MCZ 297925. Width 5 mm, height 3 mm.

Figure 5. *Helicina calliostoma* Pease. Marquesas [Islands]. Lectotype MCZ 74950. Width 9 mm, height 6 mm.

Figure 6. *Helicina discoidea* Pease. Tahaa [Island, Society Islands]. Holotype ANSP 14398. Width 6 mm, height 3 mm.

Figure 7. *Helicina rugulosa* Pease. Tahaa [Island, Society Islands]. Lectotype MCZ 297922. Width 3 mm, height 2 mm.

Figure 8. *Helicina zigzac* Pease. Oualan [Kusaie or Kosrae Island, Caroline Islands]. Lectotype ANSP 14485. Width 6 mm, height 4.5 mm.

Figure 9. *Helicina oceanica* Pease. Kingsmill [Islands, Kiribati]. Lectotype MCZ 176561. Width 4 mm, height 3 mm.

Figure 10. *Petrocyclos parva* Pease. Aitutake [Aitutaki Atoll], Hervey Islands [Cook Islands]. Lectotype ANSP 13406. Width 3 mm, height 3 mm.

Figure 11. *Helicina brazieri* Pease. Niue [Island; 19°S, 170°W]. Lectotype MCZ 74947. Width 6 mm, height 5 mm.

Figure 12. *Helicina maugeriae rubicunda* Pease. [Tahiti, Society Islands]. Lectotype ANSP 14512. Width 13 mm, height 8 mm.

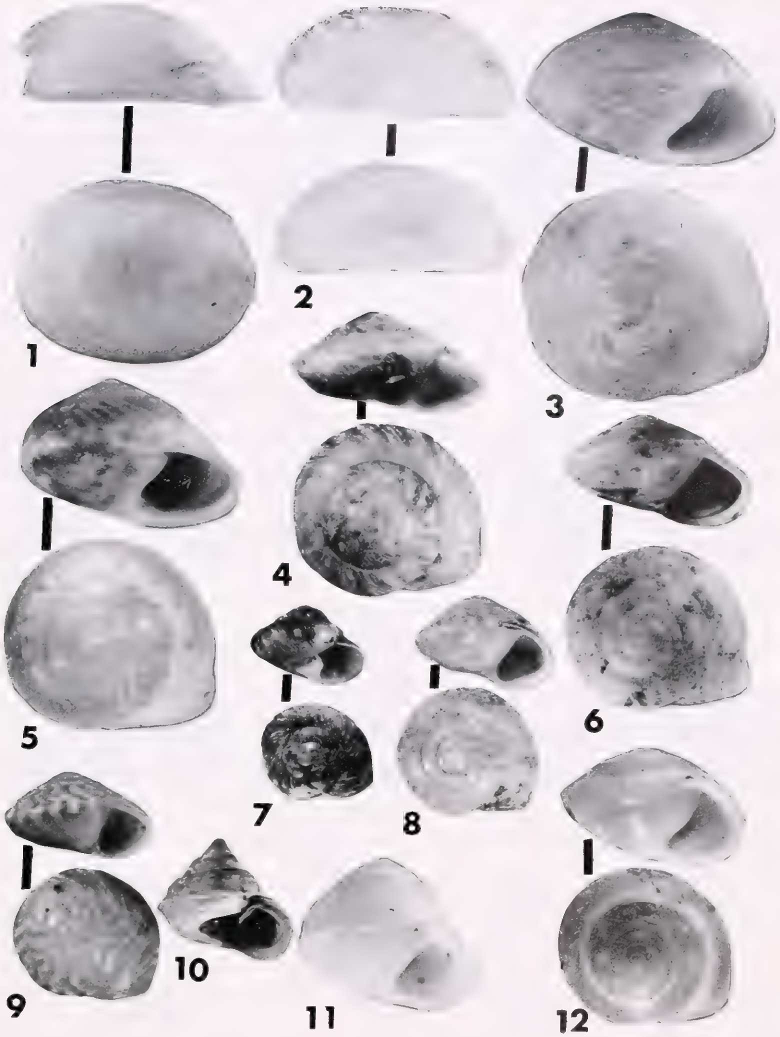
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Plate 5

Plate 6

Figure 1. *Gena rosacea* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 40756. Length 8.5 mm, width 5 mm.

Figure 2. *Gena laevis* Pease. Tahiti [Society Islands]. Lectotype ANSP 40754. Length 9 mm, width 5.5 mm.

Figure 3. *Cassis umbilicata* Pease. Sandwich [Hawaiian] Islands. Lectotype MCZ 298907. Width 43 mm, height 64.5 mm.

Figure 4. *Alcyna lineata* Pease. [Puuloa] Oahu [Hawaiian Islands]. Holotype MCZ 31724. Width 1.5 mm, height 2 mm.

Figure 5. *Atys costulosa* Pease. [Waimalu] Oahu [Hawaiian Islands]. Holotype MCZ 31714. Width 2 mm, height 3 mm.

Figure 6. *Cerithium cylindraceum* Pease. Paumotus [Tuamotu Archipelago]. Paratype MCZ 297939. Width 10 mm, height 20.5 mm.

Figure 7. *Cithara* [*Cythara*] *decussata* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype ANSP 15651. Width 4 mm, height 9 mm.

Figure 8. *Cithara* [*Cythara*] *paucicostata* Pease. Tahiti [Society Islands]. Lectotype MCZ 231925. Width 3.5 mm, height 8 mm.

Figure 9. *Cythara strigata* Pease. [Howland Island; 0°49′N, 176°40′W]. Lectotype MCZ 49990. Width 3 mm, height 7 mm.

Figure 10. *Cithara* [*Cythara*] *brevis* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype ANSP 15652. Width 3.5 mm, height 7 mm.

Figure 11. *Cithara* [*Cythara*] *daedalea* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 15663. Width 2 mm, height 4.5 mm.

Figure 12. *Citharopsis ornata* Pease. Tahiti [Society Islands]. Lectotype ANSP 16919. Width 1.5 mm, height 3.5 mm.

Figure 13. *Citharopsis gracilis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 16921. Width 1.5 mm, height 4 mm.

Figure 14. *Clathurella maculosa* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 48693. Width 2 mm, height 5 mm.

Figure 15. *Clathurella violacea* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 231971. Width 2 mm, height 4.5 mm.

Figure 16. *Clathurella canaliculata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 231978. Width 5 mm, height 10 mm.

Figure 17. *Clathurella bicarinata* Pease. Kingsmill Islands [Kiribati]. Lectotype ANSP 15806. Width 5 mm, height 10 mm.

Figure 18. *Clathurella tumida* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 15813. Width 2.5 mm, height 6.5 mm.

Figure 19. *Columbella micans* 'Pease' Tryon. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 304063. Width 5.5 mm, height 10 mm.

Figure 20. *Collonia granulosa* Pease. Ponape [Pohnpei Island, Caroline Islands]. Lectotype MCZ 245264. Width 3 mm, height 2.5 mm. Photographed by James H. McLean.

Figure 21. *Collonia picta* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype MCZ 245268. Width 4.5 mm, height 4 mm. Photographed by James H. McLean.

Figure 22. *Columbella sandwichensis* Pease. Sandwich [Hawaiian] Islands. Lectotype MCZ 297950. Width 8 mm, height 12 mm.

Figure 23. *Conus purus* Pease. Niihau Island [Hawaiian Islands]. Holotype MCZ 72331. Width 22.5, height 41 mm.

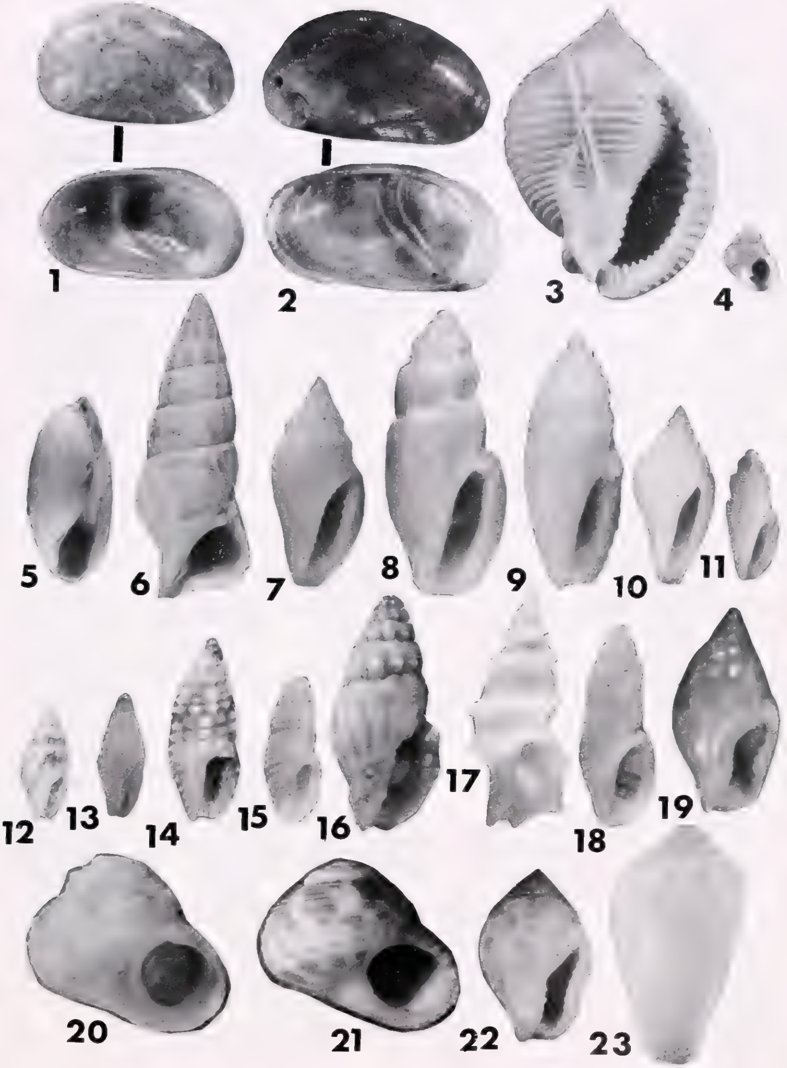
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Plate 6

Plate 7

Figure 1. *Cylindra formosa* Pease. Ascension [Pohnpei Island, Caroline Islands]. Holotype MCZ 260605. Width 6 mm, height 14 mm.

Figure 2. *Daphnella curta* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 16956. Width 2 mm, height 4 mm.

Figure 3. *Daphnella crenulata* Pease. [Howland Island; 0°49′N, 176°40′W]. Lectotype ANSP 15694. Width 2 mm, height 7 mm.

Figure 4. *Engina ovata* Pease. Howland Island [0°49′N, 176°40′W]. Lectotype ANSP 34536. Width 8 mm, height 12 mm.

Figure 5. *Engina variabilis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 260618. Width 4 mm, height 7 mm.

Figure 6. *Daphnella sandwicensis* Pease. Sandwich [Hawaiian] Islands. Lectotype MCZ 49993. Width 3.5 mm, height 8 mm.

Figure 7. *Dentiora rubida* Pease. Sandwich [Hawaiian] Islands. Lectotype MCZ 297951. Width 2 mm, height 3 mm (2 views).

Figure 8. *Drillia lauta* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype ANSP 15692. Width 4 mm, height 8.5 mm.

Figure 9. *Eulima inflexa* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 59334. Width 4 mm, height 10 mm.

Figure 10. *Eulima venusta* Pease. Tahiti [Society Islands]. Lectotype ANSP 19788. Width 2 mm, height 6 mm.

Figure 11. *Eulima exilis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 187831. Width 4 mm, height 9 mm.

Figure 12. *Eulima subpellucida* Pease. Tahiti [Society Islands]. Lectotype MCZ 31709. Width 7 mm, height 16 mm.

Figure 13. *Euchelus angulatus* Pease. Annaa [Anaa] Island [Tuamotu Archipelago]. Lectotype ANSP 40671. Width 5 mm, height 5 mm.

Figure 14. *Fastigiella squamulosa* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype ANSP 36702. Width 11 mm, height 27 mm.

Figure 15. *Latirus liratus* Pease. Marquesas [Islands]. Lectotype MCZ 302628. Width 15 mm, height 28.5 mm.

Figure 16. *Latirus gibbus* Pease. Howland Island [0°49′N, 176°40′W]. Lectotype MCZ 261182. Width 8 mm, height 13 mm.

Figure 17. *Latirus granulosa* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 261181. Width 11 mm, height 20.5 mm.

Figure 18. *Mitra saltata* Pease. Islands of the Central Pacific. Lectotype MCZ 260613. Width 3 mm, height 7.5 mm.

Figure 19. *Leptothyra costata* Pease. Maui [Hawaiian Islands]. Lectotype MCZ 245261. Width 4 mm, height 4 mm.

Figure 20. *Mitra assimilis* Pease. [Huahine [*sic*] Island, Society Islands]. Lectotype ANSP 28718. Width 7 mm, height 17 mm.

Figure 21. *Marginella pyriformis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 29541. Width 2 mm, height 4 mm.

Figure 22. *Marginella pacifica* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 29415. Width 2.5 mm, height 4 mm.

Figure 23. *Marginella paumotensis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 29497. Width 2.5 mm, height 5 mm.

Figure 24. *Mucronalia gracilis* Pease. Tahiti [Society Islands]. Lectotype MCZ 288506. Width 2 mm, height 4 mm.

Figure 25. *Engina nodicostata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 260614. Width 3.5 mm, height 6 mm. Photographed by Kenneth J. Boss.

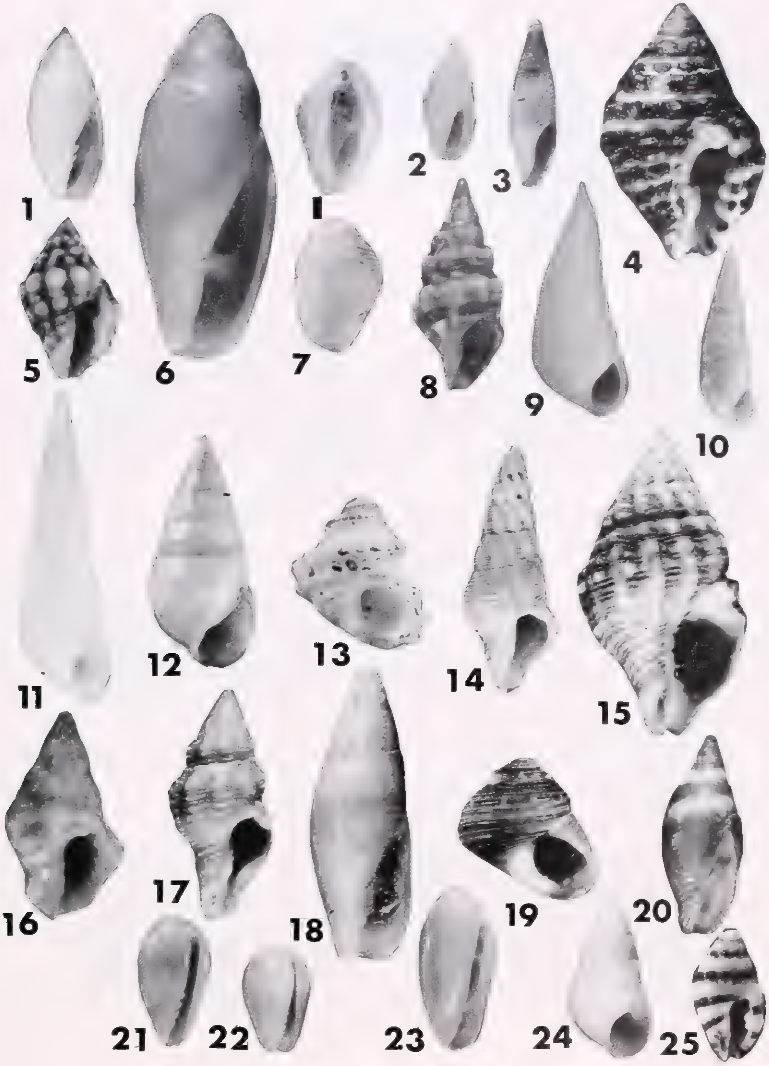
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Plate 7

Plate 8

Figure 1. *Terebra sulcata* Pease. [Honolulu] Oahu [Hawaiian Islands]. Lectotype MCZ 49967. Width 5 mm, height 22.5 mm.

Figure 2. *Narica granifera* Pease. Jarvis [Island, Line Islands. 0°22′33″S, 159°54′11″W]. Lectotype ANSP 37301. Width 8.5 mm, height 9 mm.

Figure 3. *Narica delicata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 40201. Width 6.5 mm, height 6 mm.

Figure 4. *Nassa approximata* Pease. [Ascension (Pohnpei) Island, Caroline Islands]. Lectotype MCZ 151800. Width 9.8 mm, height 24.5 mm.

Figure 5. *Nassa gracilis* Pease. Ascension [Pohnpei Island, Caroline Islands]. Lectotype MCZ 228822. Width 11 mm, height 19.5 mm.

Figure 6. *Nassa obliqua* Pease. Islands of the Central Pacific. Lectotype MCZ 228823. Width 12 mm, height 15.5 mm.

Figure 7. *Nerita maculata* Pease. Tahiti [Society Islands]. Lectotype ANSP 37490. Width 15.6 mm, height 16.5 mm.

Figure 8. *Neritina dispar* Pease. Roratonga [Rarotonga, Cook Islands]. Lectotype ANSP 37714. Width 8 mm, height 9 mm.

Figure 9. *Neritopsis interlirata* Pease. Annaa [Anaa] Island, [Tuamotu Archipelago]. Lectotype MCZ 73479. Width 10 mm, height 10 mm.

Figure 10. *Odostomia polita* Pease. Tahiti [Society Islands]. Lectotype MCZ 10562. Width 7 mm, height 7 mm.

Figure 11. *Odostomia rosacea* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19959. Width 2 mm, height 6 mm.

Figure 12. *Odostomia rubra* Pease. [Anaa Island] Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19955. Width 2 mm, height 8 mm.

Figure 13. *Planaxis abbreviata* Pease. Tahiti [Society Islands]. Paralectotype MCZ 187833. Width 6 mm, height 9.5 mm.

Figure 14. *Odostomia striata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 10491. Width 1.5 mm, height 4.5 mm.

Figure 15. *Odostomia debilis* Pease. Howland [Island; 0°49′N, 176°40′W]. Lectotype MCZ 297933. Width 2 mm, height 9 mm.

Figure 16. *Olivella* (*Callianax*) *simplex* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28969. Width 2 mm, height 4.5 mm.

Figure 17. *Pachypoma virescens* Pease. Tarawa Island [Kiribati]. Lectotype MCZ 302624. Width 26 mm, height 28 mm.

Figure 18. *Terebra sculptilis* Pease. [Honolulu] Oahu [Hawaiian Islands]. Lectotype MCZ 248804. Width 4.5 mm, height 24 mm.

Figure 19. *Purpura marmorata* Pease. Apaian [Abaiang] Island [Kiribati]. Lectotype MCZ 177824. Width 27 mm, height 45 mm.

Figure 20. *Omphalius turbinatus* Pease. Gulf of [Golfo de] California, La Paz [Baja California Sur, Mexico]. Lectotype ANSP 40820. Width 16.5 mm, height 14 mm.

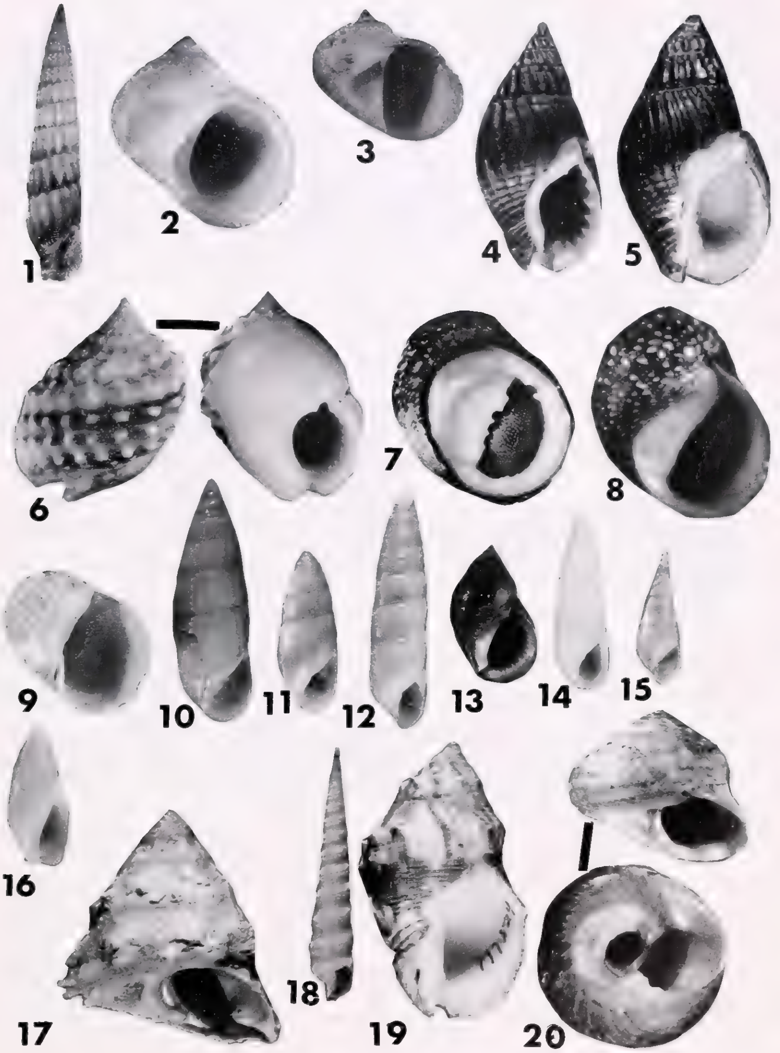
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Plate 8

Plate 9

Figure 1. *Planaxis atra* Pease. Marquesas [Islands]. Lectotype ANSP 18282. Width 5.5 mm, height 9 mm.

Figure 2. *Planaxis abbreviata* Pease. Tahiti [Society Islands]. Lectotype ANSP 18261. Width 6 mm, height 8 mm.

Figure 3. *Rissoa gracilis* Pease. [Kauai] Sandwich [Hawaiian] Islands. Lectotype MCZ 178853. Width 1 mm, height 2.5 mm.

Figure 4. *Rissoina striatula* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 178844. Width 4 mm, height 8 mm.

Figure 5. *Rissoina tenuistriata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19253. Width 4 mm, height 9 mm.

Figure 6. *Rissoina costulata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19241. Width 2 mm, height 4 mm.

Figure 7. *Rissoa flammea* Pease. Caroline [Islands]. Lectotype MCZ 178868. Width 1 mm, height 2.68 mm. From Ponder and de Keyzer.

Figure 8. *Sistrum rugulosum* Pease. Howland [Island; 0°49′N, 176°40′W]. Lectotype ANSP 36740. Width 5.5 mm, height 8 mm.

Figure 9. *Sistrum striatum* Pease. Kingsmill [Islands, Kiribati]. Lectotype ANSP 36735. Width 8.5 mm, height 16.5 mm.

Figure 10. *Strigatella brunnea* Pease. Polynesia [(Paumotus) Tuamotu Archipelago]. Lectotype ANSP 29722. Width 10.5 mm, height 21.5 mm.

Figure 11. *Scalaria perplexa* Pease. Hawaii [Hawaiian Islands]. Lectotype MCZ 181978. Width 12.5 mm, height 27 mm.

Figure 12. *Scalaria umbilicata* Pease. Oahu [Hawaiian Islands]. Holotype MCZ 187393. Width 4 mm, height 9.5 mm.

Figure 13. *Scalaria crispata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19575. Width 7 mm, height 16 mm.

Figure 14. *Scalaria decussata* Pease. Hawaii [Hawaiian Islands]. Lectotype ANSP 19585. Width 4 mm, height 10 mm.

Figure 15. *Stylifera deformis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19836. Width 4 mm, height 11.5 mm.

Figure 16. *Scalaria paumotensis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 19581. Width 5 mm, height 9 mm.

Figure 17. *Taheitea* [*sic*] *pallida* Pease. Tahiti; Huaheine [*both* Society Islands; localities not differentiated on label]. Lectotype ANSP 12659. Width 2.5 mm, height 6.5 mm.

Figure 18. *Terebra suffusa* Pease. [Honolulu] Oahu [Hawaiian Islands]. Lectotype MCZ 248802. Width 10 mm, height 30 mm.

Figure 19. *Terebra costellifera* Pease. [Honolulu] Oahu [Hawaiian Islands]. Lectotype MCZ 248800. Width 6 mm, height 20 mm.

Figure 20. *Thala alba* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28755. Width 2.5 mm, height 8 mm.

Figure 21. *Terebra lauta* Pease. Oahu [Hawaiian Islands]. Holotype ANSP 33589. Width 5.5 mm, height 20 mm.

Figure 22. *Thala angiostoma* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28754. Width 4 mm, height 12 mm.

Figure 23. *Sistrum triangulatum* Pease. Hawaii [Island]. Lectotype MCZ 295580. Width 14 mm, height 24 mm. Photographed by Kenneth J. Boss.

Figure 24. *Torinia discoidea* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 38804. Width 5.5 mm, height 3 mm.

Figure 25. *Trochus marmoreus* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 40614. Width 4.5 mm, height 6 mm.

Figure 26. *Trochus conoidalis* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 18868. Width 4 mm, height 4 mm.

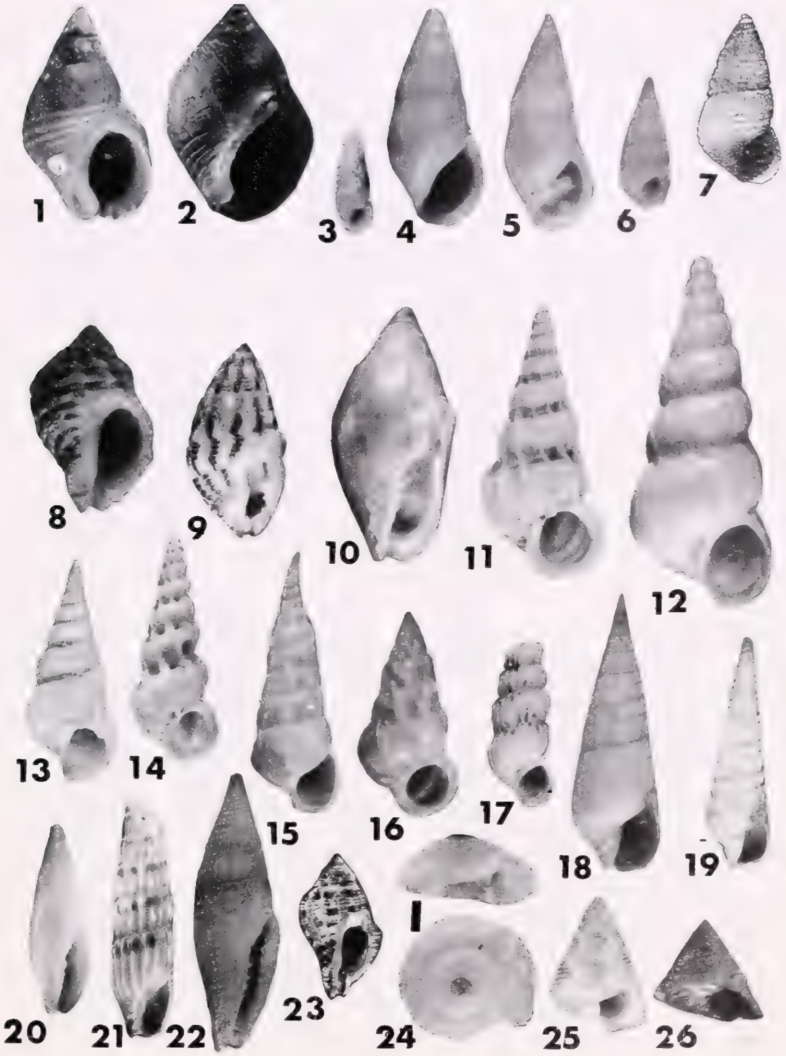
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Plate 9

Plate 10

Figure 1. *Triphoris costatus* Pease. Annaa [Anaa Island, Tuamotu Archipelago]. Lectotype MCZ 273206. Width 8 mm, height 25 mm.

Figure 2. *Triphoris pustulosus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50077. Width 5.3 mm, height 8 mm.

Figure 3. *Triphoris sulcosus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50080. Width 2 mm, height 8 mm.

Figure 4. *Triphoris tuberculatus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50081. Width 2 mm, height 8 mm.

Figure 5. *Triforis marmorata* 'Pease' Martens and Langkavel. [Kauai] Sandwich [Hawaiian] Islands. Lectotype MCZ 50055. Width 3 mm, height 10.5 mm.

Figure 6. *Triphoris brunneus* Pease. Apaiang [Abaiang] Island [Kiribati]. Lectotype MCZ 73922. Width 2 mm, height 7 mm.

Figure 7. *Triphoris minimus* Pease. [Haena] Kauai [Hawaiian Islands]. Lectotype MCZ 50071. Width 1 mm, height 3 mm.

Figure 8. *Triphoris pallidus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50073. Width 1.5 mm, height 6.5 mm.

Figure 9. *Triphoris granosus* Pease. Tahiti [Society Islands]. Lectotype MCZ 273207. Width 2 mm, height 7 mm.

Figure 10. *Triphoris gracilis* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50058. Width 1.5 mm, height 7.5 mm.

Figure 11. *Triphoris oryza* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50072. Width 2 mm, height 7.5 mm.

Figure 12. *Triphoris robustus* Pease. Makaimo [Makemo Island, Tuamotu Archipelago]. Lectotype MCZ 73923. Width 2 mm, height 5.5 mm.

Figure 13. *Triphoris maculatus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 50069. Width 2 mm, height 4 mm.

Figure 14. *Triphoris similis* Pease. [Haena] Kauai [Hawaiian Islands]. Lectotype MCZ 50079. Width 1.5 mm, height 4.5 mm.

Figure 15. *Triphoris perfectus* Pease. Kauai [Hawaiian Islands]. Lectotype MCZ 302553. Width 1 mm, height 4 mm.

Figure 16. *Triton intermedius* Pease. Oahu [Hawaiian Islands]. Lectotype MCZ 191331. Width 22.5 mm, height 42 mm.

Figure 17. *Triton cylindricus* Pease. Tahiti [Society Islands]. Lectotype MCZ 239749. Width 4.5 mm, height 11 mm.

Figure 18. *Truncatella concinna* Pease. Apaiang [Abaiang Island, Kingsmill Islands, Kiribati]. Lectotype MCZ 178650. Width 3 mm, height 7 mm.

Figure 19. *Truncatella pacifica* Pease. Oualan [Kusaie or Kosrae Island, Caroline Islands]. Lectotype MCZ 59799. Width 3 mm, height 8 mm.

Figure 20. *Turricula modesta* Pease. [Ponape Island, Caroline Islands] Polynesia. Lectotype ANSP 28780. Width 12 mm, height 38 mm.

Figure 21. *Turricula* (*Costellaria*) *fortiplicata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28844. Width 3 mm, height 7 mm.

Figure 22. *Turbonilla elongata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 10537. Width 5 mm, height 18 mm.

Figure 23. *Turcica coreensis* Pease. Corea [Korea] Sea. Lectotype MCZ 104609. Width 21.5 mm, height 25 mm.

Figure 24. *Turricula* (*Pusia*) *nodulosa* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28713. Width 4 mm, height 9 mm.

Figure 25. *Trivia corrugata* Pease. Paumotus [Tuamotu Archipelago]. Lectotype MCZ 303451. Width 4.5 mm, height 6 mm.

Figure 26. *Trochus excilis* Pease. Pautomus [Tuamotu Archipelago]. Lectotype MCZ 104617. Width 4 mm, height 6 mm.

Figure 27. *Turricula* (*Costellaria*) *plicatula* Pease. Paumotus [Tuamotu Archipelago]. Lectotype ANSP 28845. Width 3 mm, height 7 mm.

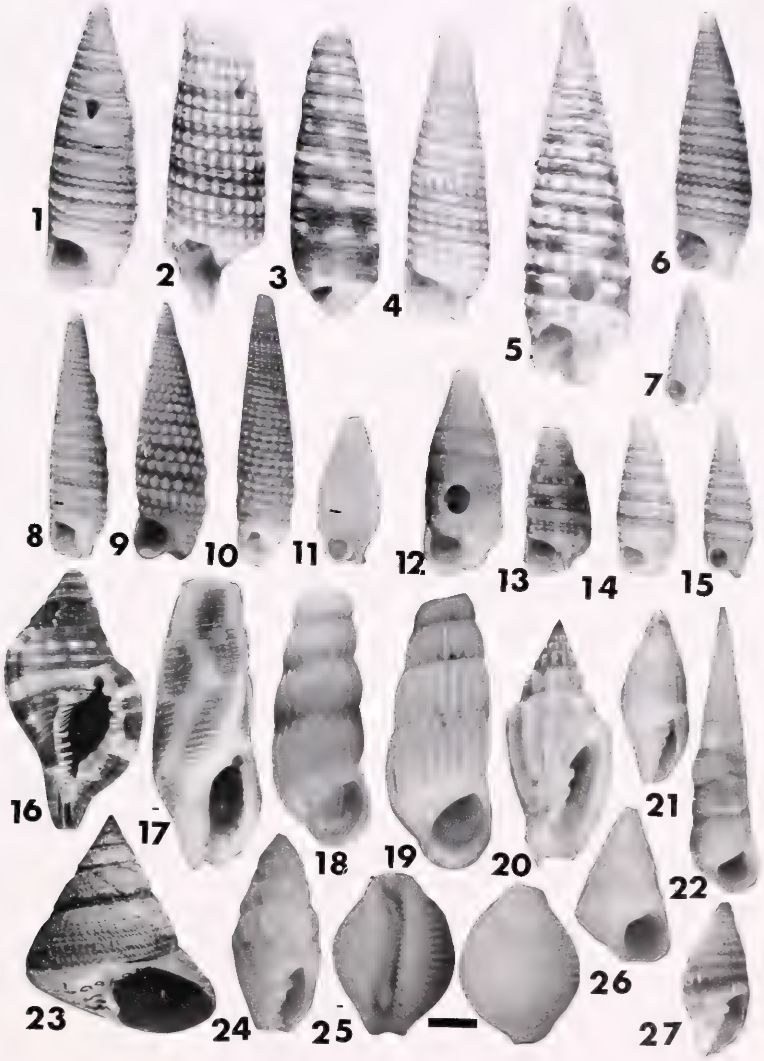
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Plate 10

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The Neotropical Orb-Weaver Genus *Metazygia* (Araneae: Araneidae)

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THE NEOTROPICAL ORB-WEAVER GENUS *METAZYGIA* (ARANEAE: ARANEIDAE)

HERBERT W. LEVI[1]

ABSTRACT. *Metazygia* are Neotropical nocturnal orb weavers. Many species are small, less than 5 mm total length. They are found from the southeastern United States to Argentina, but most species occur in the Amazon area and southeastern South America. Although lacking a paramedian apophysis in the male palpus, they exhibit other characters that suggest that they be grouped (together with *Eustala*) close to *Alpaida*.

There are 86 Neotropical species: 68 new (79%) and only 18 previously known (21%). Also, there are two Nearctic species, *M. carolinalis* and *M. calix*, making a total of 88 species of *Metazygia*. Of the 68 new species, 18 are known from both sexes, 16 from the male only, and 34 from the female only. Six names are synonymized for the first time.

The females of all species are believed to rest in a retreat at the side of the web during daytime, and many build the orb with an open sector adjacent to the retreat.

INTRODUCTION

This is one of a series of revisions of Neotropical orb weavers (complete list in Levi, 1993b). These revisions should make it possible for researchers to identify Neotropical orb weavers, not possible earlier as some previously described species had never been illustrated and males had not been matched to females. Examining and illustrating the holotype specimens of old names is one of the most important tasks of the revisor. After all the genera of the family have been revised, the relationship of the genera to each other can be studied.

METHODS AND MATERIALS

The methods have been described in detail in Levi (1993b). As in previous papers, eye sizes are expressed as ratios, comparing the diameter of the measured eye (with cornea in profile) to that of the anterior median eyes (Levi, 1993b, figs. 27, 28). Distances between eyes of the anterior row are expressed as diameters of the anterior median eyes (in profile); distances between eyes of the posterior row are given as diameters of the posterior median eyes. The height of the clypeus (the distance between the lower edge of the anterior median eyes and the edge of the carapace) is given in diameters of an anterior median eye (Levi, 1993b, fig. 28f). These measurements are approximate, as araneid eyes are variable and difficult to measure accurately.

Secondary Homonyms. The superb spider catalogs by Petrunkevitch, Roewer, and Bonnet, which so greatly facilitate the work of systematists, lumped genera. As a result of lumping genera, secondary homonyms are created: specific names that are unique in their own genera turn out to be homonyms when placed in the large genera *Aranea* or *Araneus*, having been used with *Aranea* or *Araneus* previously.

Petrunkevitch (1911) and also Roewer (1942) made new names for the secondary homonyms. I have dismissed these new names when returning species to their previous genera. In this I have followed other authors. For example, Petrunkevitch (1911) lumped 18 genera, replacing *Singa moesta* with *metuens*, *Singa maculata* with *tusus*, and *Singa variabilis* with *varians*, among others. These Petrunkevitch replacement names have not been used in Comstock (1912), Gertsch (Comstock, rev. edit.

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Gertsch 1940), or Kaston (1948). All have tried to avoid name changes.

According to Article 59 of the International Code of Zoological Nomenclature (ICZN, 1985), a junior secondary homonym replaced before 1961 is permanently invalid. Article 59b says that if the replacement name for such a junior secondary homonym is the cause of confusion, then the case is to be referred to the Commission. Article 59d says "a species group name rejected after 1960 on grounds of junior secondary homonymy is to be reinstated by anyone who believes the two species group taxa in question are not congeneric. . . ." The newer method (59d) has been used by American arachnologists all along and has avoided confusion.

Roewer (1942, 1955) replaced some secondary homonyms cited in this revision (e.g., *Aranea palloides* Roewer for *Metazygia pallidula*, *Aranea errans* for *Metazygia erratica*). But Roewer had the good judgment not to use Petrunkevitch's replacement names (e.g., for *Singa*). Also, Bonnet (1955–59) did not use the replacement names of Petrunkevitch when returning species to their original genera (e.g., Petrunkevitch changed *Zilla guttata* to *gemellus* when he placed it in *Araneus*, but the name is back to *Zilla guttata* in Bonnet, 1959). Perhaps the International Commissioners should make the rules more flexible.

It is unfortunate that many younger arachnologists still give their new species overworked names such as *pallida*, *maculata*, and *variabilis*, which are likely to have been used before in the same family or in related families and may be the cause for later discovery of secondary homonymy.

Lectotypes. As in previous papers, lectotypes have been designated when syntypes belonged to different species. They were not indicated routinely as an aspect of the revision; there is no requirement to do so (ICZN, 1985: Art. 74). A decision has to be made on whether to designate a male or a female as the lectotype. This choice may become critical later, if it is found that the presumed species actually consists of sibling species recognizable only in one sex, not in the other.

Collections. Specimens from the following collections were used. I thank the curators for making the material available for this study:

AD	A. Dean, Texas A and M University, College Station, Texas, United States
AMNH	American Museum of Natural History, New York, United States; N. Platnick, L. Sorkin
ANSP	Academy of Natural Science, Philadelphia, Pennsylvania, United States
BMNH	Natural History Museum, London, England; P. Hillyard, F. Wanless
CAS	California Academy of Sciences, San Francisco, United States; W. J. Pulawski, D. Ubick
CD	C. Deeleman, Ossendrecht, Netherlands
CUC	Cornell University Collection, kept in the AMNH; N. Platnick
CV	Carlos Valderrama A.; Bogotá, Colombia
DU	D. Ubick, San Francisco, California, United States
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, United States; G. B. Edwards
HECO	Hope Entomology Collections, Oxford University, Oxford, England; J. Lansbury
IBNP	Inventario Biológico Nacional, San Lorenzo, Paraguay; J. A. Kochalka
IELP	Instituto de Ecologia, Casilla 20127, La Paz, Bolivia; E. Forna, J. Coddington
IESC	Instituto Ecologia y Systematica, Cuban Academy of Science, Havana, Cuba, L. Armas

INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Est. Amazonas, Brazil; C. Magalhaes
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium; L. Baert
JEC	J. Carico, Lynchburg, Virginia, United States
JMM	J. Maes, León, Nicaragua
MACN	Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina; E. A. Maury
MCN	Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil; E. H. Buckup
MCP	Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, RS, Brazil; A. A. Lise
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts, United States
MECN	Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador; L. Avilés
MEG	M. E. Galiano; Buenos Aires, Argentina
MIUP	Museo de Invertebrados, Universidad de Panamá, Panama City, Panama; D. Quintero A.
MLP	Museo de Universidad Nacional, La Plata, Argentina; R. F. Arrozpide
MNHN	Muséum National d'Histoire Naturelle, Paris, France; J. Heurtault, C. Rollard
MNHNC	Museum Nacional de Historia Natural, Havana, Cuba; G. Alayón
MNRJ	Museu Nacional, Rio de Janeiro, Brazil; A. Timotheo da Costa
MNSD	Museo Nacional de Historia Natural, Santo Domingo, República Dominicana; Félix Del Monte
MUSM	Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; D. Silva D.
MZSP	Museu de Zoologia, Universidade de São Paulo, São Paulo, SP, Brazil; P. Vanzolini, J. L. Neme
MZUF	Museo Zoologico de "La Specola" Università di Firenze, Florence, Italy; S. Mascherini
NMW	Naturhistorisches Museum, Vienna, Austria; J. Gruber
NRMS	Naturhistoriska Riksmuseet, Stockholm, Sweden; T. Kronestedt
PAN	Polska Akademia Nauk, Warszawa, Poland; A. Riedel, J. Prószynski, A. Slojewska, E. Kierych
PMY	Peabody Museum, Yale University; C. Remington, D. G. Furth
REL	R. E. Leech; Edmonton, Alberta, Canada
SMF	Forschungsinstitut Senckenberg, Frankfurt am Main, Germany; M. Grasshoff
SR	Susan Riechert; Knoxville, Tennessee, United States
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., United States; J. Coddington
ZMB	Zoologisches Museum der Humbolt Universität, Berlin, Germany; M. Moritz
ZMK	Zoologisk Museum, Copenhagen, Denmark; H. Enghoff
ZSM	Zoologisches Staatssammlung, Munich, Germany

I would also like to thank R. Buskirk and W. Eberhard for natural history information and G. B. Edwards and P. Vanzolini for information on collecting sites. C. D. Dondale gave advice on a nomenclatural problem. Laura Leibensperger helped thoughout and read the manuscript. L. R. Levi improved the wording. E. H. Buckup and two anonymous readers carefully read the manuscript and made numerous corrections and improvements. D. Sherry helped with the final word processing. The research was started with the help of NSF grant BMS 75-05719. Publication costs of this study were covered in part by the Wetmore Colles Fund.

Metazygia F. P.-Cambridge

Metazygia F. P.-Cambridge, 1903: 501. Type species by original designation *M. wittfeldae* (McCook). The gender of the name is feminine.

Diagnosis. Metazygia differs from other araneid genera by having a glabrous carapace with posterior median eyes that face up and almost touching each other, and an oval abdomen, that is widest at the middle (Figs. 5, 12).

In many species, but not all, the female has a round, laterally compressed scape on the ventral face of the epigynum (Figs. 1–4).

The palpus of the male has only one patellar seta and lacks a paramedian apophysis (Figs. 45, 112).

Contiguous posterior median eyes are found also in *Larinia* and *Cyclosa* and among some species of *Alpaida*, *Araneus*, *Aculepeira*, and *Dubiepeira*. *Larinia* differs from *Metazygia* by having an elongate abdomen. These genera (except *Alpaida*) differ from *Metazygia* by having the carapace setose and by the annulate scape. All except *Alpaida* and *Cyclosa* have two macrosetae on the palpal patella, and the male palpus has a distal hematodocha. *Cyclosa* differs by having the carapace narrow in the cephalic region. Both *Alpaida* and *Cyclosa* have a paramedian apophysis in the male palpus. *Metazygia* females can easily be confused with those of *Singa*, *Nuctenea* (*Larinioides*), and *Zygiella* because of similar abdomen coloration and shape. These three genera are not found in the Neotropical region, although *Zygiella x-notata* (Clerck) and *Larinioides sclopetaria* (Clerck) are common in Chile where they have been introduced. No *Metazygia* species are known from Chile. *Zygiella* males differ from *Metazygia* by having a cone-shaped palpal tibia, as is common in tetragnathids; *Nuctenea* and *Larinioides* males have two palpal patellar macrosetae. Some *Metazygia* females have been confused with *Chrysometa*, but this has tetragnathid characters (Levi, 1986). The species of these similar genera all make a tube-shaped, silken retreat.

It is possible to have doubts and misplace *Metazygia* species if only a female is available.

Relationship. Metazygia is closest to the genus *Eustala*. Shared apomorphies include the anteriorly projecting scape in some *Metazygia* females (Figs. 263, 270), the lateral placement of the median apophysis in the male palpus (M in Figs. 44, 45), and, in the palpus of larger species, a semitransparent blister below the distal prong of the terminal apophysis (B in Figs. 45, 46). In spite of these unusual shared characters, *Eustala* is distinguished by the position of the posterior median eyes, on a slight swelling and facing laterally, and by the shape of the abdomen, subtriangular to elongate, widest anteriorly and often with a median white streak on the underside. Also, the carapace of *Eustala* is setose, while that of *Metazygia* is glabrous (Table 1).

Both *Metazygia* and *Eustala*, although lacking a paramedian apophysis in the male palpus (Figs. 45, 112), have to be grouped near *Alpaida* and other genera having a paramedian apophysis. They mostly have only a single palpal patellar seta and the position of the conductor of the male palpus is usually on the inside face of the tegulum (and not on the outside rim of the tegulum as in *Araneus*-related genera). There is a relative absence of the distal hematodocha in the male palpus, a structure also prominent in *Araneus*-related genera. There is abundant pigment around the eyes in *Metazygia* species, as there is in *Alpaida* species. Many of the genera related to *Alpaida* (but not *Alpaida* or *Metazygia*) have abdomens with two or three posterior, median humps on the ab-

TABLE 1. DIFFERENTIAL CHARACTERS OF *PARAWIXIA* (PARW), *ERIOPHORA* (ERIO), *ACANTHEPEIRA* (ACAN), *WAGNERIANA* (WAGN), *EUSTALA* (EUST), *ACACESIA* (ACAC), *ALPAIDA* (ALPA), *OCREPEIRA* (OCRE), *CYCLOSA* (CYCL), AND *METAZYGIA* (METZ).

	PARW	ERIO	ACAN	WAGN	ACAC	ALPA	OCRE	CYCL (prov.)	METZ	EUST (prov.)
Pattern										
Carap. glabrous	–	–	–	–	–	[+*]	–	–	[+]	–
Paired spots on carap.	+*	–	+	–	–	–	–	–	–	–
Marks between ME and LE	+*	–*	+	–	–	–	–*	–	–	–
Black eye rings	–	–	–	–	–	[+*]	–	–	+*	–
Sides of thoracic reg. black	–	–	–	[+*]	–	–	–*	–	–	–
Pattern on sternum	[+*]	–	–	–	–	–	–	–	–	–
Abd. v. black with white streak	–	–	–	–	–	–	–	–	–	[+]
Female morphology										
Eye reg. narrow	–	–	–	–	[+]	–	–	+	–	–
LE on sides of tuber.	+	–	+	–	–	–	–	–	–	–
PME on slight swelling	–*	–	–	–	+	–	+*	–	–	+
PME touch	–	–	–	–	–	–	–	+	[+]	–
Carap. swollen behind eyes	+	+	+	+	–	+	+*	–	–	–
Abd. with tubers	4–15	0–3	12+	9–15	–	–*	[2*]	0–2	–	–*
Ant. median abd. tuber	–*	–	+	–	–	–	–	–	–	–
Abd. subspherical	+*	+	+	–	–	–	–	–	+	+*
Abd. oval	–*	–	–	+	+	+	–*	+	[+]	+*
Abd. with tail	–	–	–	+*	–	–	–	+*	–	+*
Three median post. tubers	+	–*	+	+	–	–	–	–	–	–
Abd. glabrous	–	–	–	–	–	[+]	–	–	[+]	–
Epigynum										
Scape	+	+	+	–	+	–	+*	+	+*	+
Lat. flattened scape	–	–	–	–	–	–	–	–	[+*]	–
Lobe	–	–	–	+	–	+	–*	–	+*	–
Knob at tip	–*	–	–	+	–	–*	–	–	–	–
Notch on face	–	–	–	–	–	[+*]	–	–	–	–
Scape ant. projection	–	–	–	–	–	–	–	–	–*	[+]
Male morphology										
Ceph. reg. wide	–	–	[+]	–	–	–	–	–	–	–
Hook on coxa I	+	+	–	+	+	+*	+	+*	+	+
Macrosetae on coxa III, IV	+*	+*	+*	–	+*	+*	+*	+*	+*	–
Trochanter IV macrosetae	+*	+*	–	–	–	–*	–	–	–	–
Tibia II modified	–	–	–	–	+	–*	–	–	–	–
Carapace with lobes	–	–	–	–	–	–	–	–	[+*]	–
Fangs clasping	–	–	–	–	–	–	–	–	[+*]	–
Palpus										
Much wider than long	–	–	–	–	–	–	–	[+]	–	–
Patella macrosetae	1**	[2**]	1	1	1	1*	1	1	1	1
Y narrow	–	[+]	–	–	–	–	–	–	–	–
PM present	+	+	+	+	+	+	+	+	–	+
M lateral	–	–	–	–	–	–	+	–	+	–
SA blister-shaped	–	–	–	–	–	–	–	–	+	–
M soft	–	–	–	–	–	–	–	–	–*	–

* There are exceptions.

** *P. bistriata* and *E. nephiloides* (Levi, 1971) have a large macroseta and a smaller one on the male* palpal patella.

Bracketed characters are autapomorphies for the genus.

Abbreviations: abd., abdomen; ant., anterior; carap., carapace; ceph., cephalic; post., posterior(ly); prov., provisionally; reg., region; tuber(s)., tubercle(s); v., venter. LE, lateral eyes; M, median apophysis; ME, median eyes; PM, paramedian apophysis; PME, posterior median eyes; Y, cymbium.

Data from Levi, 1971, 1976, 1977, 1988, 1991b, 1992, 1993b.

domen (*Eriophora, Parawixia, Wagneriana, Acanthepeira,* and also *Eustala*), a feature uncommon in any other spider. Perhaps the lack of paramedian apophysis and the sometimes intermediate position of the conductor (Fig. 112) indicate an intermediate relationship (Table 1).

Description. The cephalothorax is orange to orange-brown in alcohol, the legs rarely with dark rings. The abdomen has a characteristic folium pattern consisting of pairs of brackets (Figs. 5, 124) or sometimes a *Zygiella*-like pattern (Figs. 58, 110). The smallest species have a white (green or silvery when alive) abdomen with a black band around the anterior margin (Figs. 325, 330). The green color, which washes out in alcohol, is known for *M. octama, M. serian,* and *M. lopez* (Eberhard, personal communication). The black band around the anterior is not found in other Neotropical araneids. The carapace has few setae, and the median eye quadrangle is always narrower posteriorly (except in *M. vaupes,* where it is square). The anterior median eyes are slightly larger than the posterior medians, and the laterals are always the smallest. The height of the clypeus is less than the diameter of an anterior median eye. The eye region is usually all black but in some species lacks pigment (Fig. 336). The cephalic region of the carapace is more than half the width of the thoracic region; in *M. uma* (Fig. 224), it is almost equal in width.

The abdomen is oval, widest in the middle. In some small species, it is almost spherical (Figs. 306, 307); in some large species, almost cylindrical (Fig. 228). Sometimes the abdomen is anteriorly flattened (Fig. 317) or anteriorly projecting (Fig. 242) or has an anterior notch (*M. vaupes,* Fig. 301).

The males of three species have modified fangs (see later).

Genitalia. In the larger species, the epigynum has a laterally flattened scape, which is round in lateral view (Figs. 1–4, 69–71). The greatest diversity of epigyna occurs in the small species, where some even have a long scape (Figs. 322, 328). In many species, the scape appears to be torn off by the male after mating, and it may be unusual to find a female with the scape intact (Figs. 277–280). (Removal of the scape by the male may protect its sperm by preventing additional female matings.) Often it is not known whether there is a scar from a torn scape or the middle area is sculptured (Figs. 285–287, 365, 366). Part of the base of the epigynum is torn off in *M. mundulella* (Fig. 234) and may be missing also in *M. saturnino* (Figs. 197, 198) and *M. amalla* (Figs. 247, 248). While it is common for an araneid male to remove the scape, destruction of the base of the epigynum is not otherwise known in araneid spiders. In *M. erratica,* the opening of the epigynum is sealed with an amorphous black secretion that is difficult to remove (Figs. 370–372). A similar brown exudate may be present on the epigynum of *M. lopez.* In still other species, part of the male embolus breaks and plugs the opening of the epigynum (Fig. 40).

Internal female genitalia were examined in two pairs of species: *M. wittfeldae* and *M. dubia,* and *M. zilloides* and *M. keyserlingi.* No differences were found in the similar species that might be useful for determinations.

Male. Males of some small species have the carapace margin lobed above the first coxae (Figs. 384, 390), a modification not seen in males of other genera. All males have one macroseta on the palpal patella. Males of all except three species (*M. gregalis, M. benella,* and *M. yobena*) have a tooth on the endite that faces a tooth or tubercle at the proximal end of the palpal femur. These three species also have modified fangs: the fangs have a lobe (Figs. 261, 262, 269, 276), presumably to hold the female during mating. *Metazygia gregalis* also has the distal end of the chelicerae modified as a protecting flange (Fig. 261).

All species have a small hook on the distal margin of the first coxa, but if very small, the hook may have moved, to face the second coxa. The second tibiae are usually thicker than the first and are armed with macrosetae. Males may have macrosetae on the first tibia, also. Some males have a short macroseta on the fourth coxa and sometimes on the third, as in related genera (those with one patellar macroseta).

Some species have a large terminal apophysis (A) in the palpus, with a terminal prong above a transparent blister (B in Figs. 45, 112); others have lost the terminal apophysis and have only one sclerite beyond the embolus (E) or none (Fig. 260). The part remaining with the embolus (Figs. 221, 230, 237) might be a reduced terminal apophysis or the embolus lamella (L of Figs. 45, 54). There is no way at present to determine the homology. Here it is called the "lamella" (in keys and descriptions). None of the *Metazygia* species has a paramedian apophysis. As in *Eustala*, the median apophysis has moved ventrally to the side of the palpus (M in Figs. 44, 45, 112, 113) and has lost its sclerotization, often becoming soft and white. The conductor (C) has moved in the same direction, and there is no projection from the conductor toward the cymbium, as in *Alpaida*, to form a paramedian apophysis.

The position of the conductor in araneids may be on the rim of the tegulum, visible in ventral view as in *Neoscona* (Levi, 1993a, C in figs. 6, 7, 16), in *Dubiepeira* (Levi, 1991a, center of fig. 525, C in fig. 526), and in many species of *Araneus* (Levi, 1991a, figs. 3, 14, the light, round sclerite in center of fig. 22), or it may be on the inside face of the tegulum, closer to the cymbium, as in most species with a paramedian apophysis. In the latter case, it is also surrounded on the outside by the wall of the tegulum, as in *Micrathena* (Levi, 1985, C in figs. 6, 9), *Alpaida* (Levi, 1988, C in fig. 10), and *Wagneriana* (Levi, 1991b, fig. 19). In *Metazygia*, which lack a paramedian apophysis, the conductor may be on the rim, as in *M. crewi* (C in Fig. 113) and *M. isabelae* (at 8 hr in Fig. 92), or inside, below the rim of the tegulum, as in *M. castaneoscutata* (center of Fig. 308), or below the rim but hanging over it, as in *M. zilloides* (C in Figs. 44, 45) and *M. gregalis* (at 10 hr in Fig. 259, C in Fig. 260).

In addition to the blister-shaped subterminal apophysis and the lateral position of the median apophysis, there are additional peculiarities in the palpus of the larger species. The radix is pushed "down," out of the way, and is in a much "lower" position (R in Figs. 44, 45, 112) than in species of other genera. Also, there is a stipes (I) in the form of a band that overlaps the dorsal surface of the palpal bulb (bottom third of Fig. 46), to which the embolus and its lamella are attached (bottom left of Fig. 46, and also Fig. 112). Finally, the median apophysis may be in a more common position (at 5 hr in Fig. 243; M in Fig. 245), the radix farther "up" in the palpus (below the embolus in Fig. 308).

There are many small species in *Metazygia*. As is common in spiders, the smallest species display the greatest diversity in genitalia. Great diversity in genitalia is also known for *Micrathena* species, mostly medium-sized. Matching males with females of the same species is difficult because so many species are similar in appearance, differing only in genitalic structures.

It has not been possible to clearly group *Metazygia* species into subgenera because the diversity of characters does not fall into corrolative patterns. The larger species have a pattern of brackets on the abdomen (Fig. 5), have a terminal apophysis in the palpus (A in Fig. 45), and have the median apophysis (M in Figs. 44, 45) soft and toward the side. Small species have a black band around the anterior of the abdomen (Figs. 381, 404), a diversity of female epigyna, have the male palpus without terminal apophysis, and the median apophysis in the more common araneid position at 4–5 hr in the left palpus (Figs. 383, 389). However, the *Metazygia curari* female (Figs. 144–146) has the characteristic flattened, round scape, as does *M. wittfeldae* (Figs. 1–4), and the male lacks a terminal apophysis (Fig. 148). *Metazygia mundulella* also has this kind of scape (Figs. 231–234), but the male has a median apophysis with sclerotized points at 5 hr in the left palpus (Fig. 237). *Metazygia serian* (Fig. 175) and *M. adisi* (Fig. 141), with a flattened round "*Metazygia*" scape, have the black band of small species around the anterior of the abdomen.

Natural History. All species build a vertical orb and have a retreat that is usually above the web and attached to a branch, wall, ceiling, or curled leaf. The spider rests in the retreat during the day and in the center of the web at night. Some webs have a vacant sector in the part of the orb adjacent to the retreat (Plate 1): the vacant sector orb is known for *M. wittfeldae, zilloides, keyserlingi, chicanna,* and *incerta.* The webs of *M. keyserlingi* and *M. laticeps* are kept up during the day and have a signal line (Eberhard, personal communication). "All other species built at night, many (all?) quite early in the evening and not generally have either an open sector or a recognizable retreat" (Eberhard, personal communication). *Metazygia incerta* rebuilds orbs every two to four days (Buskirk, personal communication). Some species take down their webs during the day (Lubin, 1978).

While *Metazygia wittfeldae* is usually solitary, the web size and structure are the same when they aggregate and the angle of the orb continues to vary from just horizonal to vertical at Monteverde, Costa Rica (Buskirk 1986).

Eberhard (personal correspondence) writes,

> I have watched both *gregalis* and *octama* build in great hurry (rapidly, with little exploratory behavior) just as the light is failing, and have web photos of *chenevo* . . . at 6 pm; *serian* at 5 pm, *lopez* at 7 pm; *wittfeldae* here [Costa Rica] also builds early in the evening. Thus I suspect these species are working on the flush of insects which fly just at dusk. One *keyserlingi* also had a web up at night and since I saw another web of this species which was rebuilt around noon after rain, I suspect it is like *gregalis* in having not one but a series of webs during each 24 hour period. . . .

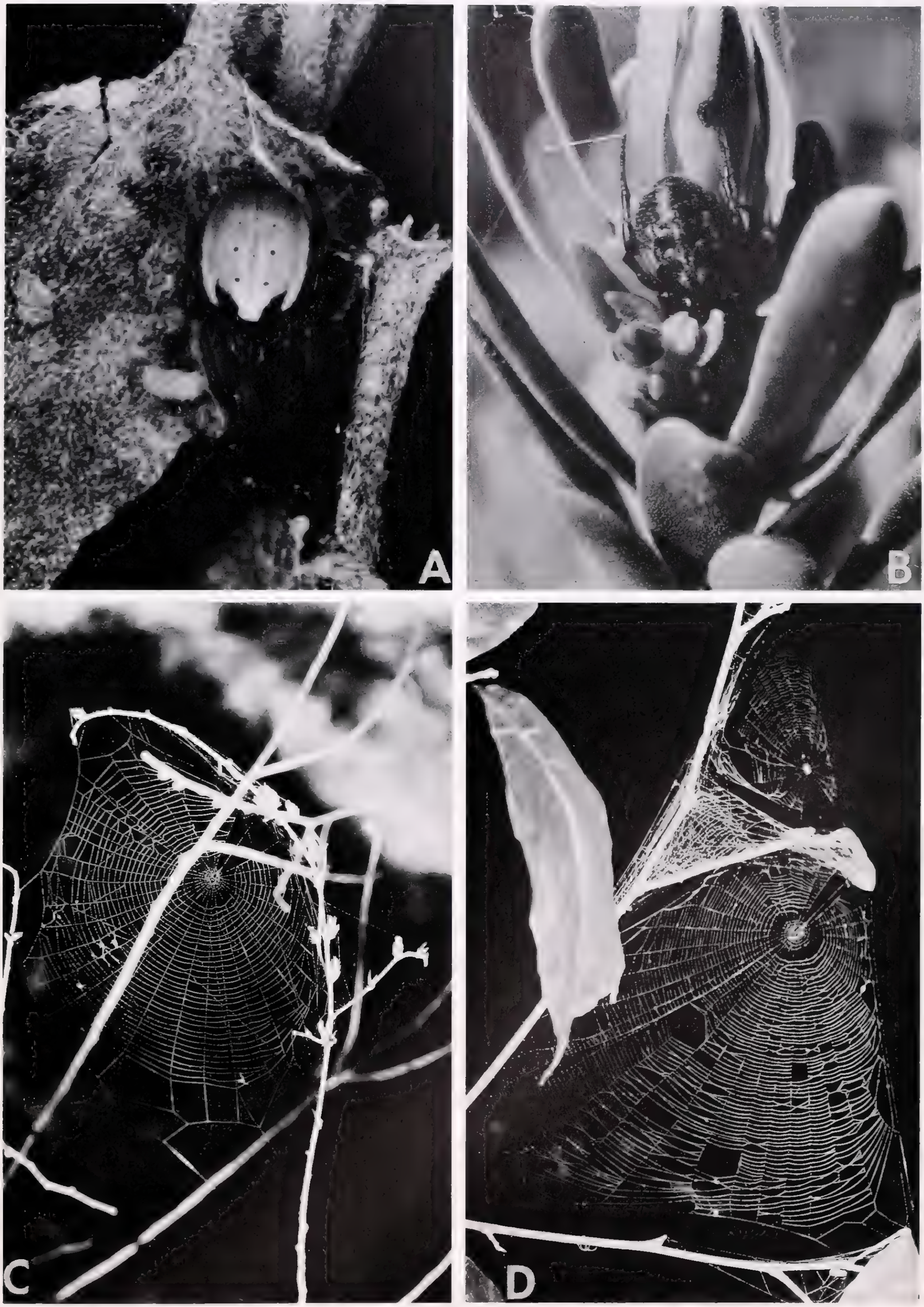
Species occur often in great abundance, females and males together. But because they are difficult to collect by sweeping or beating, many species are present in collections only as single individuals.

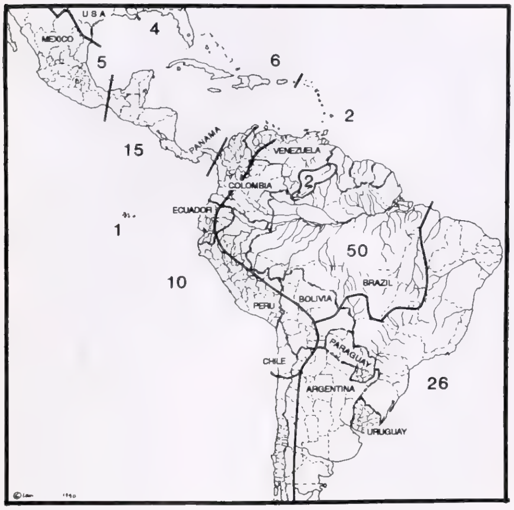
The following observations are excerpted from Eberhard (personal communication):

> Relatively open habitat (rel. early secondary growth, grass): *lopez, gregalis, octama, pallidula, wittfeldae, yobena, benella, lazepa, serian, chenevo.* I suspect some species at least of preferring to be near water (esp. *pallidula*), and of liking twigs, barbed wire or other relatively rigid supports for their webs, but have seen *yobena* and *chenevo* on webs in tall grass. On buildings (especially near lights): *wittfeldae, gregalis, dubia.* Silk retreats, more or less cylindrical (open at both ends—spider will leave on rear if bothered from front side) during the day: *octama, gregalis,* (in this case, often in cracks or other protected sides); the retreat of this species generally has no connection whatsoever with the web, which is often left intact during the day when the spider is in its retreat, and it is thus generally impossible to associate a given spider with the vestiges of a given web during the day. In contrast, *octama* removes the web completely during the day, I think usually without a single line being left up, and its retreat is at least sometimes on a green leaf in relatively exposed posi-

→

Plate 1. A, *Metazygia chicanna* n. sp. B, *M. dubia* (Keyserling). C, photograph of web of *M. crewi* (Banks); horizontal diameter 6 cm. D, photograph of web of *M. keyserlingi* Banks, horizontal diameter in middle about 12 cm.


A
B
C
D



Map 1. The number of species of *Metazygia* in various areas.

tion. I don't know much about the retreats of the other nocturnal species (and since retreats may be disassociated from webs, I was unlikely to be aware of the spider's retreat when I found the spider on a web at night).

Dynamics of webs: I can only give you details for *gregalis* and *octama*. The *octama* web seems relatively fragile, and the spiders had often torn down the web and were feeding on a ball of prey not more than a couple of hours after dusk. I never saw one of these (they lived in our yard in Cali) put up another web, but might have missed it (espcially if a second web was put up just before dawn and then soon torn down). I had some students do all night projects with *gregalis*, and they found that the same individual built two to three webs per night. Generally the first web was just at dusk, and the others substantially later at night.

M. gregalis is a generalist when it comes to feeding. I have the impression that intraspecific variation in the form in the *Metazygia* orb is relatively high in *M. gregalis*.

Sizes of prey items are reported in Castillo and Eberhard (1983).

Distribution. *Metazygia* is known only from the Americas. There are several pairs of very similar allopatric species, one north, the other south, without overlap: *wittfeldae* and *dubia*, and *zilloides* and *keyserlingi*.

Metazygia species of the southeastern United States, not otherwise cited in this paper, are as follows: *M. carolinalis* (Archer) (the male is unknown); and *M. calix* (Walckenaer), NEW COMBINATION. *Metazygia calix* (Levi, 1976, figs. 137–144) was placed in *Alpaida* but has genitalia similar to those of *M. laticeps* (Figs. 226, 227, 230) and *M. sendero* (Figs. 216, 217, 221).

Misplaced Species. Metazygia livida Mello-Leitão, 1941: 151, 1♀. Female from Argentina is a *Dictyna* (Dictynidae).

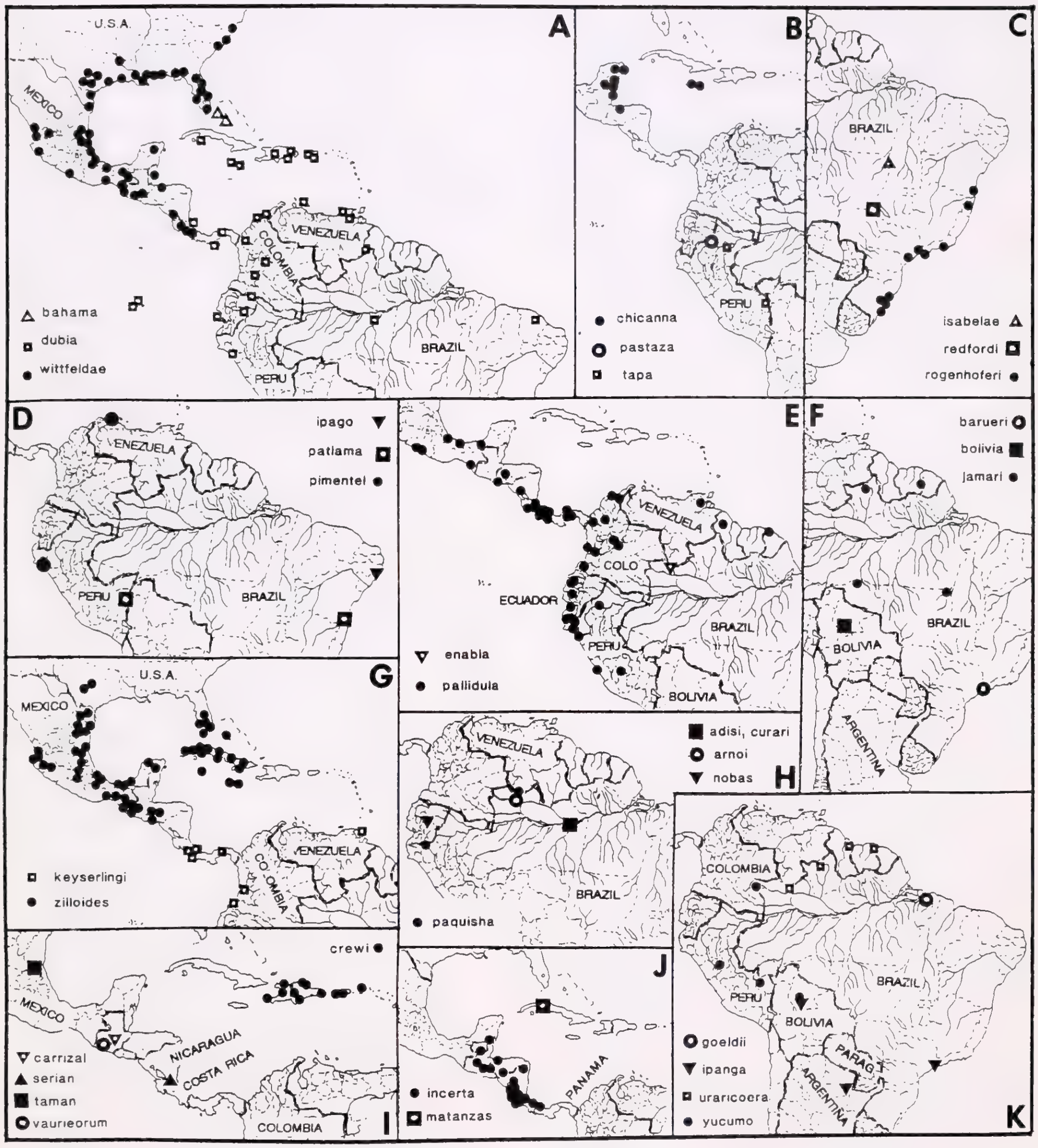
Metazygia unquiformis:—Valle and Valle, 1972: 33 is *Alpaida veniliae* (Keyserling) (Levi, 1988: 402).

Keys. Keys are difficult to construct for species of which only one or a few individuals are known. With few specimens, one does not know whether or not the coloration is characteristic, whether or not the epigynum has been torn apart by a male when mating, whether the male has a virgin embolus with a cap or if he has mated, and whether all males of the species have a macroseta on the fourth coxa or only the one sampled.

For using the key, the female's epigynum has to be slightly pulled out with a curved needle to see the posterior face of the structure.

KEY TO FEMALE *METAZYGIA*

1. Epigynum with an anterior projection (Figs. 254, 263, 270) 2
– Epigynum otherwise 4
2(1). Epigynum in ventral view wider than long (Fig. 254); Central America, West Indies to northern Argentina (Map 3E) .... *gregalis*
– Epigynum in ventral view longer than wide (Figs. 263, 270) 3
3(2). Epigynum with a deep notch on the posterior border (Fig. 270); anterior projection without pair of wings (Fig. 270); Amazon area; São Paulo (Map 3C) .... *yobena*


A
U.S.A.
MEXICO
VENEZUELA
COLOMBIA
PERU
BRAZIL
△ bahama
▫ dubia
● wittfeldae
B
PERU
● chicanna
○ pastaza
▫ tapa
C
BRAZIL
isabelae △
redfordi ▫
rogenhoferi ●
D
VENEZUELA
PERU
BRAZIL
ipago ▼
patlama ▫
pimentel ●
E
VENEZUELA
COLO
ECUADOR
BRAZIL
PERU
BOLIVIA
▽ enabla
● pallidula
F
barueri ○
bolivia ■
jamari ●
BRAZIL
BOLIVIA
ARGENTINA
G
U.S.A.
MEXICO
VENEZUELA
COLOMBIA
▫ keyserlingi
● zilloides
H
VENEZUELA
BRAZIL
■ adisi, curari
○ arnoi
▼ nobas
● paquisha
I
MEXICO
NICARAGUA
COSTA RICA
COLOMBIA
crewi ●
▽ carrizal
▲ serian
■ taman
○ vaurieorum
J
PANAMA
● incerta
▫ matanzas
K
COLOMBIA
BRAZIL
PERU
BOLIVIA
PARAG.
ARGENTINA
○ goeldii
▼ ipanga
▫ uraricoera
● yucumo

Map 2. Distribution of *Metazygia* species.

– Epigynum without notch on posterior border (Fig. 263); anterior projection with a pair of wings (Fig. 263); Panama, Colombia (Map 3C) .... *benella*

4(1). Epigynum in posterior view with a median plate forming a septum in an hour glass-shaped depression as in Figure 108; Greater Antilles (Map 2I) .... *crewi*

– Epigynum with median posterior plate otherwise 5

5(4). Epigynum in ventral view with a scape that extends beyond the posterior margin of the base (Figs. 193, 277, 298, 303, 314, 322, 328) 6

– Epigynum with scape not extending beyond posterior margin (Figs. 2, 55, 231) 12

6(5). In ventral view scape extending from epigynum's posterior margin (Figs. 298, 314) 7

– Scape extending from middle or anterior of basal plate (Figs. 193, 277, 303, 322, 328) 8

7(6). Epigynum with notch on each side (Fig. 298), anterior of abdomen indented (Fig. 301); western Amazon area (Map 4A) .... *vaupes*

– Epigynum without notch (Fig. 314), abdomen oval to subspherical (Fig. 317); Rio de Janeiro State, Brazil (Map 4B) .... *floresta*

8(6). Scape attached on anterior of base (Figs. 193, 277, 328) 9

– Epigynum with scape attached in middle of plate (Figs. 303, 322) 11

9(8). Scape thick and with a deep groove (Fig. 193); Bahia State, Brazil (Map 3A) .... *uratron*

– Scape otherwise 10

10(9). Scape thin and transparent (Fig. 328); Amazon area to Misiones Prov., Argentina (Map 4C) .... *lagiana*

– Scape thick, opaque (Fig. 277); Amazon area to northern Argentina (Map 3D) .... *voluptifica*

11(8). Epigynum with notch on each side in posterior view (Fig. 323); Mexico, Central America (Map 4G) .... *nigrocincta*

– Epigynum with posterior view otherwise (Fig. 305); Amazon area (Map 4B) .... *castaneoscutata*

12(5). Abdomen with paired, dark patches (Fig. 90); Goiás State, Brazil (Map 2C) .... *redfordi*

– Abdomen marked otherwise (Figs. 58, 175) 13

13(12). Epigynum with scape round, laterally flattened (Figs. 1–4, 62–64, 158–160, 164–166) 14

– Epigynum otherwise (Figs. 114, 133, 189, 370) 42

14(13). Epigynum with bordered depression or opening, visible in ventral view (Figs. 40, 55, 74, 87, 158, 168, 172) 15

– Epigynum otherwise (Figs. 2, 35, 129, 144, 231) 22

15(14). Openings oval, very large and on each side of epigynum (Fig. 74); Mexico, to Guianas and Peru (Map 2E) .... *pallidula*

– Openings otherwise (Figs. 40, 48, 55, 121, 158, 159) 16

16(15). Openings along anterior of plate (Figs. 40, 49, 158, 168) 17

– Openings in middle or posterior 20

17(16). In posterior view epigynum longer than wide; with narrow median plate (Fig. 169); northern Amazon region, Guianas (Map 2K) .... *uraricoera*

– In posterior view epigynum wider than long, median plate wide (Figs. 41, 50, 159) 18

18(17). Openings anterior, lateral (Figs. 39, 48) 19

– Openings near median, indistinct (Fig. 158); western Amazon area (Map 2K) .... *yucumo*

19(18). United States to Honduras, West Indies (Map 2G) .... *zilloides*

– Costa Rica, Trinidad to Colombia (Map 2G) .... *keyserlingi*

20(16). Abdomen with black band around anterior (Fig. 175); Costa Rica (Map 2) .... *serian*

– Abdomen otherwise 21

21(20). Openings round in center of each side (Fig. 55), scape small, light, indistinct (Fig. 55); southern Mexico to Honduras, Jamaica (Map 2B) .... *chicanna*

– Openings tiny notches toward posterior of base, scape large, distinct (Fig. 121); Mexico (Map 2I) .... *taman*

22(14). In posterior view of epigynum, width of median plate equal to or less than that of laterals (Figs. 63, 95) or median plate T-shaped with vertical piece narrow (Figs. 139, 165) 23

– In posterior view median plate wider than laterals (Figs. 30, 36, 70, 126) or otherwise 26

23(22). A scale on each side of epigynum as in Figures 94 and 95; southeastern Brazil (Map 2C) .... *rogenhoferi*

– Epigynum without scale (Figs. 62, 139, 165) 24

24(23). Median plate T-shaped (Figs. 139, 165) 25

– Median plate otherwise (Fig. 63); western Amazon area (Map 2B) .... *tapa*

25(24). Arms of T-shaped median plate constricted at base and pointed (Fig. 139); Amazon area (Map 2H) .... *adisi*

– Arms not constricted (Fig. 165); southern Brazil, northern Argentina (Map 2K) .... *ipanga*

26(22). Base of epigynum on each side with shallow lateral notch as in Figures 231 and 234; southeastern Brazil (Map 3F) .... *mundulella*

– Base without such notches 27

27(26). Margin of base in ventral view entire, without notches on sides (Fig. 69); Central America (Map 2J) .... *incerta*

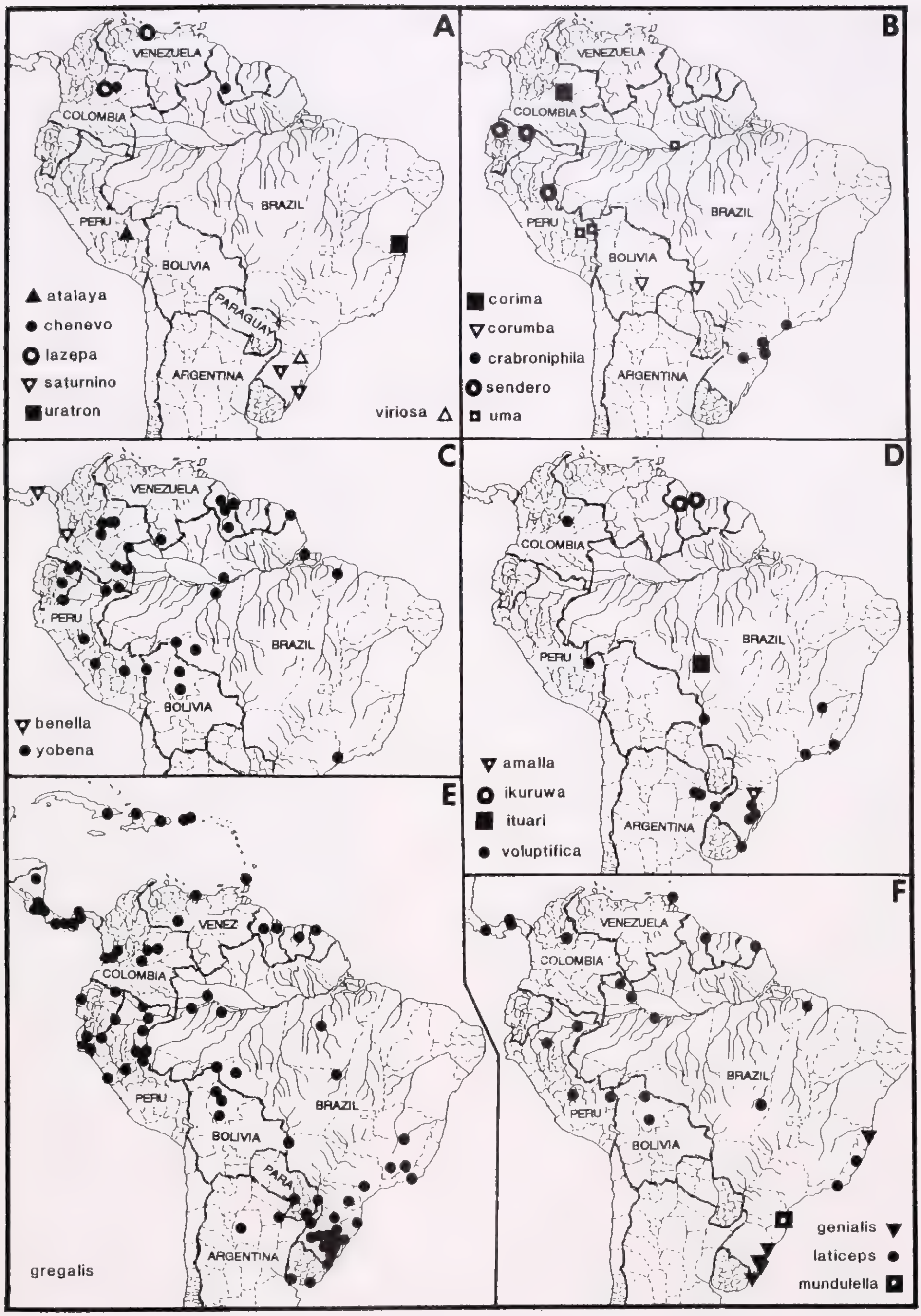
– Margin of base otherwise (Figs. 22, 100, 121, 181) 28

28(27). Folds posterior to scape in ventral view (Fig. 100); São Paulo State, Brazil (Map 2F) .... *barueri*

– Epigynum otherwise 29

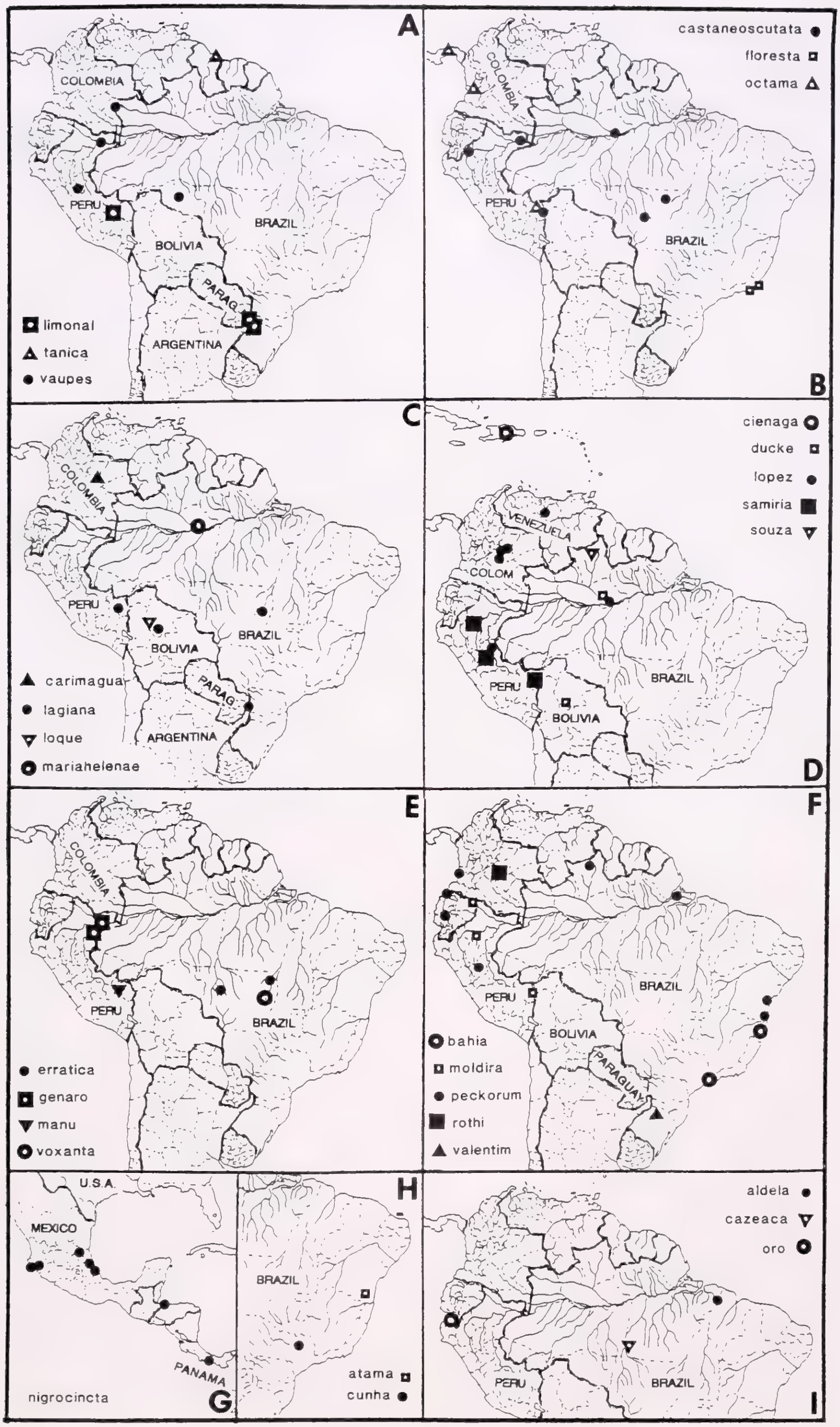
29(28). A transverse bar posterior to scape in ventral view as in Figure 181; Colombian Amazon area (Map 3A) .... *lazepa*

– Epigynum otherwise 30


A
VENEZUELA
COLOMBIA
PERU
BRAZIL
BOLIVIA
PARAGUAY
ARGENTINA
▲ atalaya
● chenevo
○ lazepa
▽ saturnino
■ uratron
viriosa △
B
VENEZUELA
COLOMBIA
PERU
BRAZIL
BOLIVIA
ARGENTINA
■ corima
▽ corumba
● crabroniphila
○ sendero
◻ uma
C
VENEZUELA
PERU
BRAZIL
BOLIVIA
▽ benella
● yobena
D
COLOMBIA
PERU
BRAZIL
ARGENTINA
▽ amalla
○ ikuruwa
■ ituari
● voluptifica
E
VENEZ
COLOMBIA
PERU
BOLIVIA
BRAZIL
PARA
ARGENTINA
gregalis
F
VENEZUELA
COLOMBIA
BRAZIL
PERU
BOLIVIA
genialis ▼
laticeps ●
mundulella ◻

Map 3. Distribution of *Metazygia* species.

30(29). A dark area on each side of scape in ventral view as in Figure 125; Amazon area (Map 2H) .... *paquisha*
– Epigynum otherwise 31
31(30). In lateral view scape about twice as long as wide (Figs. 83, 146) 32
– In lateral view scape about as long as wide (Figs. 18, 37, 123, 131) 33
32(31). Abdomen with a pair of dorsal, longitudinal white lines (Fig. 147); Amazon area (Map 2H) .... *curari*
– Abdomen with a pair of dorsal, longitudinal dusky bands (Fig. 84); Neblina area of Amazon (Map 2E) .... *enabla*
33(31). Abdomen oval, about three quarters as wide as long 34
– Abdomen elongate, about two thirds as wide as long (Fig. 153), epigynum as in Figures 150–152; Bolivia (Map 2F) .... *bolivia*
34(33). Posterior median plate with a pair of notches on each side as in Figures 30 and 178 35
– Posterior median plate otherwise 36
35(34). In ventral view length of scape about two thirds length of base (Fig. 177); Guyana (Map 3A) .... *chenevo*
– In ventral view length of scape less than half length of base (Fig. 29); Peruvian Amazon to Bahia State, Brazil (Map 2D) .... *patiama*
36(34). Median plate in posterior view heart-shaped (Fig. 130); Ecuador (Map 2H) .... *nobas*
– Median plate otherwise (Figs. 23, 36, 122) 37
37(36). Posterior median plate hexagonal (Fig. 122); Mexico (Map 2I) .... *taman*
– Posterior median plate otherwise (Figs. 23, 36) 38
38(37). Epigynum in ventral view with a slit depression on each side as in Figure 35; Pernambuco, Brazil (Map 2D) .. *ipago*
– Epigynum otherwise (Figs. 1, 2, 9, 16, 22) 39
39(38). Abdomen with paired spots (Fig. 25); posterior median plate about as long as wide (Fig. 23); Venezuela, Peru (Map 2D) .... *pimentel*
– Abdomen with folium (Figs. 5, 12, 19); posterior median plate slightly wider than long (Figs. 3, 10, 17) 40
40(39). Bahama Islands (Map 2A) .... *bahama*
– United States to northern South America, West Indies 41
41(40). Base of epigynum almost twice as wide as long in ventral view (Fig. 2); United States to Costa Rica (Map 2A) .... *wittfeldae*
– Base of epigynum narrower, about three eighths as long as wide (Fig. 16); Costa Rica, West Indies, Galapagos to northern Brazil and Peru (Map 2A) .... *dubia*
42(13). Epigynum with set off scape (Figs. 133, 185, 208, 309, 378) 43
– Epigynum without scape or with only scars of torn scape (Figs. 280, 285, 292, 360, 370, 391) 49
43(42). Scape with transverse wrinkles (Fig. 208); Cuba (Map 2J) .... *matanzas*
– Scape smooth (Figs. 133, 185, 189) 44
44(43). Scape with dent on each side as in Figure 185; Peruvian Amazon (Map 3A) .... *atalaya*
– Scape otherwise 45
45(44). Scape ventrally flattened (Figs. 189, 378) 46
– Scape knob-like (Figs. 114, 133, 309) 47
46(45). Scape subtriangular (Fig. 378); Peruvian Amazon region (Map 4E) .... *genaro*
– Scape oval (Fig. 189); Colombian Amazon region (Map 3B) .... *corima*
47(45). Posterior median plate with concave sides (Fig. 310); Panama, Colombia (Map 4B) .... *octama*
– Posterior median plate convex on each side (Figs. 115, 134) 48
48(47). Posterior median plate wider than long (Fig. 115); Guatemala (Map 2I) .... *vaurieorum*
– Posterior median plate almost as wide as long (Fig. 134); Lower Amazon area (Map 2K) .... *goeldii*
49(42). Epigynum in posterior view longer than wide (Figs. 240, 338) 50
– Epigynum in posterior view wider than long (Figs. 361, 386) 51
50(49). Posterior median plate narrower dorsally than ventrally (Fig. 338); Bolivian Amazon area (Map 4C) .... *loque*
– Posterior median plate almost rectangular (Fig. 240); coast of southeastern Brazil (Map 3F) .... *genialis*
51(49). Epigynum with scars, scape usually torn off (Figs. 197, 198, 248, 280, 292) 52
– Epigynum without distinct scars (Figs. 216, 226, 365, 391) 58
52(51). Scars in midline only (Figs. 203, 280, 285, 289) 54
– Whole venter of epigynum seemingly torn off (Figs. 197, 247) 53
53(52). Posterior median plate wider than long (Fig. 248); southern Brazil (Map 3D) .... *amalla*
– Posterior median plate square (Fig. 198); southern Brazil (Map 3A) .... *saturnino*
54(52). Posterior median plate in a depression (Fig. 286); southern Brazil (Map 3A) .... *viriosa*
– Posterior median plate otherwise (Figs. 204, 281, 290, 293) 55
55(54). Posterior median plate much wider than


A
COLOMBIA
PERU
BOLIVIA
BRAZIL
PARAG.
ARGENTINA
■ limonal
▲ tanica
● vaupes
B
castaneoscutata ●
floresta □
octama △
COLOMBIA
PERU
BRAZIL
C
COLOMBIA
PERU
BOLIVIA
BRAZIL
PARAG.
ARGENTINA
▲ carimagua
● lagiana
▽ loque
○ mariahelenae
D
cienaga ○
ducke □
lopez ●
samiria ■
souza ▽
VENEZUELA
COLOM
PERU
BOLIVIA
BRAZIL
E
COLOMBIA
PERU
BRAZIL
● erratica
■ genaro
▼ manu
○ voxanta
F
PERU
BOLIVIA
BRAZIL
PARAGUAY
○ bahia
□ moldira
● peckorum
■ rothi
▲ valentim
U.S.A.
MEXICO
PANAMA
nigrocincta
G
H
BRAZIL
atama □
cunha ●
aldela ●
cazeaca ▽
oro ○
PERU
BRAZIL
I

Map 4. Distribution of *Metazygia* species.

long (Fig. 290); Mato Grosso, Brazil (Map 3D) ..... *ituari*

– Posterior median plate otherwise (Figs. 204, 281, 293) 56

56(55). Posterior median plate Y-shaped as in Figure 293; Peruvian Amazon (Map 4A) ..... *limonal*

– Posterior median plate otherwise 57

57(56). Epigynum in ventral view with a round, shallow depression on each side as in Figure 280; Amazon area to northern Argentina (Map 3D) ..... *voluptifica*

– Epigynum in ventral view with a raised area on each side as in Figure 203; southeastern Brazil (Map 3B) ..... *crabroniphila*

58(51). Cephalic area of carapace almost as wide as thoracic area; abdomen with longitudinal stripes as in Figure 224; Amazon area (Map 3B) ..... *uma*

– Carapace otherwise 59

59(58). Epigynum in ventral view pentagonal as in Figure 333; Colombian Amazon (Map 4C) ..... *carimagua*

– Epigynum otherwise 60

60(59). Epigynum subtriangular in ventral view with shallow median groove and without distinct lip as in Figures 216 and 226; cephalic region of carapace relatively wide (Figs. 219, 228) 61

– Epigynum otherwise (Figs. 346, 360, 391) 62

61(60). Posterior median plate longer than wide (Fig. 226); Panama to Rio de Janeiro State, Brazil (Map 3F) ..... *laticeps*

– Posterior median plate wider than long (Fig. 217); Ecuador, Peru (Map 3B) ..... *sendero*

62(60). Epigynum in ventral view with posterior margin lobed and median area swollen as in Figures 342 and 351 63

– Epigynum otherwise (Figs. 346, 360, 365, 370) 64

63(62). Epigynum with depression on ventral face (Figs. 351, 354), posterior median plate dumb-bell–shaped (Fig. 352); Venezuela to Peru (Map 4D) ..... *lopez*

– Epigynum swollen on ventral face (Fig. 342), posterior median plate triangular (Fig. 343); Hispaniola (Map 4D) ..... *cienaga*

64(62). In ventral view posterior margin of epigynum with a swollen lip as in Figures 360, 365, 370 and 405 65

– Posterior margin of epigynum without swollen lip (Figs. 346, 385, 409) 68

65(64). Lip a horizontal bar as in Figure 405; posterior median plate T-shaped (Fig. 406); Rio Grande do Sul, Brazil (Map 4F) ..... *valentim*

– Lip V-, U-, or T-shaped (Figs. 360, 365, 370) 66

66(65). Posterior median plate pentagonal (Fig. 371); black amorphous material on each side posteriorly (Figs. 370, 372); Amazon area (Map 4E) ..... *erratica*

– Posterior median plate not pentagonal (Figs. 361, 366); without black amorphous material 67

67(66). Posterior median plate triangular (Fig. 361); Peruvian Amazon (Map 4D) ..... *samiria*

– Posterior median plate square, anterior to it a textured area (Fig. 366); Amazon region, Bolivia (Map 4D) ..... *ducke*

68(64). Posterior margin with a notch in middle and a lobe extending each side as in Figure 346; Amazon area (Map 4D) ..... *souza*

– Posterior margin otherwise, often with a pair of lobes (Figs. 385, 391, 401, 409) 69

69(68). In ventral view a pair of lobes as in Figure 385; posterior median plate dumb-bell–shaped (Fig. 386); Mato Grosso, Brazil (Map 4E) ..... *voxanta*

– Ventral view otherwise (Figs. 391, 401, 409) 70

70(69). A median ventral notch in posterior view of epigynum (at 12 hr in Figs. 402, 410) 71

– No notch visible in posterior view (Figs. 392, 395); Colombia, Ecuador to mouth of Amazon (Map 4F) ..... *peckorum*

71(70). Posterior median plate constricted ventrally (at 12 hr in Fig. 402); Ecuadorian, Peruvian Amazon (Map 4F) ..... *moldira*

– Posterior median plate as in Figure 410; Bahia to São Paulo States, Brazil (Map 4F) ..... *bahia*

KEY TO MALE *METAZYGIA*

1. Cheliceral bases or fangs modified with transparent lobes (Figs. 261, 262, 269, 276) 2

– Cheliceral bases or fangs not modified 4

2(1). Median apophysis (M in Fig. 260), in mesal view short (Figs. 258, 260); Central America, West Indies, South America (Map 3E) ..... *gregalis*

– Median apophysis, in mesal view, longer (Figs. 267, 274) 3

3(2). Median apophysis with a black wall (at 4 hr in Fig. 274, at 6 hr in Fig. 275); Amazon area, São Paulo State, Brazil (Map 3C) ..... *yobena*

– Median apophysis without black wall (Figs. 267, 268); Panama, Colombia (Map 3C) ..... *benella*

4(1). Fourth coxae with a macroseta or pointed tubercle 5

– Fourth coxae without macroseta or tubercle 15

5(4). Fourth coxae with a tubercle; embolus of palpus thorn-like (Fig. 357, E in Fig. 359); Venezuela, Amazon area (Map 4D) .... *lopez*
– Fourth coxae with macroseta 6
6(5). Carapace with a lobe above first coxae (Fig. 390) 7
– Carapace without lobe above first coxae 13
7(6). Abdomen posteriorly black (Fig. 388); Mato Grosso, Brazil (Map 4E) .... *voxanta*
– Abdomen posteriorly light 8
8(7). In mesal view, median apophysis projecting beyond tegulum (at 3 hr in Fig. 318, at 3 hr in Fig. 423) 9
– Median apophysis smaller and not projecting beyond tegulum (Figs. 313, 383, 418, 425) 10
9(8). Median apophysis very large, facing cymbium at 3 hr in Figure 423; Bahia, Brazil (Map 4H) .... *atama*
– Median apophysis distally rectangular in mesal view at 3 hr in Figure 318; Amazon area (Map 4C) .... *mariahelenae*
10(8). Embolus S-shaped as seen through transparent lamella (between 11 hr and at center in Fig. 313) .... *octama*
– Embolus otherwise, usually hidden (Figs. 383, 418, 425) 11
11(10). Median apophysis with bulge on side (at 3 hr in Fig. 425, right of center in Fig. 426); coastal Ecuador (Map 4I) .... *oro*
– Median apophysis without bulge (Figs. 383, 418) 12
12(11). Median apophysis subtriangular (at 3 hr in Fig. 418); Rio Grande do Sul, Brazil (Map 4H) .... *cunha*
– Median apophysis distally enlarged (at 4 hr in Fig. 383); Peruvian Amazon (Map 4E) .... *genaro*
13(6). Embolus a thread with a transverse loop as in Figures 112 and 113; Greater Antilles (Map 2I) .... *crewi*
– Embolus otherwise (Figs. 327, 332) 14
14(13). Median apophysis distally tapering to a point (at 3 hr in Fig. 327); Mexico, Central America (Map 4G) .... *nigrocincta*
– Median apophysis distally bulging as in 4 hr in Figure 332; southern Amazon region to Misiones Prov., Argentina (Map 4C) .... *lagiana*
15(4). Carapace with small lobe above first coxa (Figs. 376, 415, 421) 16
– Carapace without lobe 18
16(15). Abdomen with ventral black band as in Figure 377; Peru (Map 4E) .... *manu*
– Abdomen marked otherwise 17
17(16). Sickle-shaped embolus (Fig. 414); Colombian Amazon (Map 4F) .... *rothi*
– Embolus barely visible, hidden by large sclerotized lamella (at 11 hr in Fig. 420); eastern Pará State, Brazil (Map 4I) .... *aldela*
18(15). Abdomen with median, transverse light band (Fig. 417); palpus as in Figure 416; Amazon area (Map 4I) .... *cazeaca*
– Abdomen and palpus otherwise 19
19(18). Palpus with terminal apophysis (A in Figs. 45, 112; top of Figs. 162, 201, 207) 20
– Palpus without terminal apophysis, only a lamella (Figs. 142, 148, 213, 221, 225, 230, 237, 243–246) 38
20(19). Terminal apophysis with distal straight or slightly curved prong (Figs. 6, 13) 21
– Terminal apophysis with short distal prong (between center and 2 hr in Fig. 91); Mato Grosso, Brazil (Map 2C) .... *isabelae*
21(20). In mesal view terminal apophysis with two prongs (between center and 2 hr in Fig. 6); southeastern United States to Costa Rica (Map 2A) .... *wittfeldae*
– Terminal apophysis otherwise (Figs. 13, 27) 22
22(21). A comb projecting beyond prong in mesal view (at 1 hr in Figs. 20, 27, 66) 23
– No comb-like projection (Figs. 13, 201) 25
23(22). Comb-like projection longer than wide in mesal view (at 1 hr in Fig. 20); tegulum with pointed spine (at 3 hr in Fig. 21); Costa Rica to Guianas and northern Peru, Galapagos Islands and West Indies (Map 2A) .... *dubia*
– Comb-like projection in mesal view wider than long (at 1 hr in Figs. 27, 66); tegulum without pointed spine (Figs. 28, 67) 24
24(23). Comb small (at 1 hr in Fig. 66), most of embolus hidden behind conductor (Figs. 66, 67); northern Peruvian Amazon (Map 2B) .... *pastaza*
– Comb large (at 1 hr in Fig. 27), most of embolus exposed, only tip of conductor hidden (at 3 hr in Fig. 27); Venezuela to Peruvian coast (Map 2D) .... *pimentel*
25(22). A pointed tooth projecting beyond prong of terminal apophysis in mesal view (at 1 hr in Fig. 13, center in Fig. 14); Bahama Islands (Map 2A) .... *bahama*
– No such tooth 26
26(25). Median apophysis projecting beyond other sclerites toward 4 hr, conductor toward 3 hr with triangular space between these sclerites in mesal view (Figs. 201, 207); southern Brazil 27
– Median apophysis and conductor otherwise (Figs. 60, 99, 104, 213) 28
27(26). Conductor with a knob at tip (at 3 hr in Fig. 201); median apophysis straight

(at 4 hr in Fig. 201); Rio Grande do Sul, Brazil (Map 3A) ... *saturnino*

– Conductor tapering to tip (at 3 hr in Fig. 207); median apophysis with elbow (at 4 hr in Fig. 207); southeastern Brazil (Map 3B) ... *crabroniphila*

28(26). Tip of embolus with horseshoe-shaped structure (Fig. 104, center of Fig. 105); Guianas, Amazon area (Map 2F) . *jamari*

– Tip of embolus otherwise, or hidden by conductor (Figs. 60, 99, 162) ... 29

29(28). Embolus long, saber-shaped, and curved up (Fig. 99); southeastern Brazil (Map 2C) ... *rogenhoferi*

– Embolus otherwise (Figs. 73, 119, 162) ... 30

30(29). Embolus U-shaped (with dark cap as in Fig. 119); Guatemala (Map 2I) ... *carrizal*

Embolus otherwise ... 31

31(30). Embolus a small hook as in center of Figure 162; western Amazon area (Map 2K) ... *yucumo*

– Embolus otherwise ... 32

32(31). Embolus almost straight structure, tip hidden by terminal apophysis prong as in Figure 85; Neblina area of Amazon (Map 2E) ... *enabla*

– Embolus otherwise ... 33

33(32). Embolus thorn-shaped as in Figure 33; Peruvian Amazon to Bahia, Brazil (Map 2D) ... *patiama*

– Embolus otherwise; Mexico, Central America ... 34

34(33). Embolus lamella (L in Figs. 45, 54) covering most of embolus with one large point and a forked tooth as in Figure 73; Central America (Map 2J) ... *incerta*

– Embolus lamella otherwise (Figs. 44, 54, 60, 79) ... 35

35(34). Embolus lamella triangular tip covered by blister-like part of terminal apophysis (center in Fig. 60); southern Mexico to Honduras, Jamaica (Map 2B) ... *chicanna*

– Embolus lamella otherwise ... 36

36(35). Embolus lamella rounded as in Figure 44; Florida, Texas to Honduras, Cuba, Jamaica (Map 2G) ... *zilloides*

– Embolus lamella otherwise ... 37

37(36). Embolus lamella with axis of tip at right angle to axis of cymbium (Fig. 54); embolus without lobes (Fig. 54); Costa Rica to Trinidad and Colombia (Map 2G) ... *keyserlingi*

– Embolus lamella with tip pointing toward 1 hr in Figure 79; embolus with two lobes below (Figs. 79, 80); Mexico to Guianas and Peru (Map 2E) . *pallidula*

38(19). Median apophysis long, thumb-shaped and projecting beyond tegulum (at 3 hr in Figs. 302, 308) ... 39

– Median apophysis otherwise ... 40

39(38). Embolus lamella projecting beyond cymbium edge as at 11 hr in Figure 308; Amazon area (Map 4B) ... *castaneoscutata*

– Cymbium edge extending beyond lamella as at 11 hr in Figure 302; Amazon area (Map 4A) ... *vaupes*

40(38). Tegulum with a large fold having a comb (at 12 hr in Figs. 283, 295) ... 41

– Tegulum otherwise ... 42

41(40). Embolus axis at right angle to axis of cymbium (Fig. 283); Amazon area to southeastern Brazil (Map 3D) *voluptifica*

– Embolus axis forming an acute angle with that of cymbium (Fig. 295); Guyana (Map 4A) ... *tanica*

42(40). Tegulum with a large distal lobe (at 12 hr in Figs. 237, 243) ... 43

– Tegulum otherwise or only small lobe ... 44

43(42). Lamella with subparallel sides distally concave (at 3 hr in Fig. 243, at 10 hr in Fig. 244, L in Fig. 245); median apophysis with one point (at 5 hr in Fig. 243, M in Fig. 245); Bahia State to Rio Grande do Sul, Brazil (Map 3F) ... *genialis*

– Lamella distally narrowing (at 3 hr in Fig. 237); median apophysis with two points (at 5 hr in Fig. 237); southeastern Brazil (Map 3F) ... *mundulella*

44(42). Median apophysis "hanging down"; upside-down T-shaped (at 6 hr in Fig. 250); Guianas (Map 3D) ... *ikuruwa*

– Median apophysis otherwise (Figs. 142, 149, 213, 221, 230) ... 45

45(44). Lower edge of median apophysis semicircular (at 5 hr in Figs. 213, 230) ... 46

– Median apophysis otherwise (Figs. 142, 148, 221, 225) ... 47

46(45). Palpus as in Figure 230; Panama to Rio de Janeiro State, Brazil (Map 3F) ... *laticeps*

– Palpus as in Figure 213; Bolivia to Mato Grosso do Sul (Map 3B) ... *corumba*

47(45). Embolus thread-like curving "above" tegulum (at 12 hr in Fig. 142); Neblina area of Amazon (Map 2H) ... *arnoi*

– Embolus otherwise (Figs. 148, 221, 225) ... 48

48(47). Median apophysis having a "bottom" bulge and tip hidden by conductor in mesal view (Figs. 148, 149); Amazon area (Map 2H) ... *curari*

– Median apophysis otherwise (Figs. 221, 225) ... 49

49(48). Median apophysis as in Figure 225; Amazon area (Map 3B) ... *uma*

– Median apophysis as in Figure 221; Ecuador to Amazonian Peru (Map 3B) ... *sendero*

Metazygia wittfeldae (McCook)
Figures 1–7; Map 2A

Epeira wittfeldae McCook, 1894: 168, pl. 7, figs. 6, 7, ♀, ♂. Three female, two male, and one imm. male syntypes from Florida in ANSP, examined.
Metazygia wittfeldae:—F. P.-Cambridge, 1904: 501, pl. 47, figs. 22, 23, ♀, ♂. Roewer, 1942: 368. Bonnet, 1957: 2820. Levi, 1977: 92, pl. 6, figs. 90–103, ♀, ♂.

Description. Female from Tabasco, Mexico. Carapace orange, cephalic region dark orange. Chelicerae dark orange. Labium, endites, sternum orange. Coxae, legs orange. Dorsum of abdomen with gray pattern on white pigment spots (Fig. 5); venter light orange-gray, without marks. Posterior median eyes 0.5 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 8.0 mm. Carapace 4.2 mm long, 3.1 wide, 1.9 behind lateral eyes. First femur 3.2 mm, patella and tibia 4.1, metatarsus 3.0, tarsus 1.2. Second patella and tibia 3.8 mm, third 2.3, fourth 3.1.

Male from Tabasco, Mexico. Color as in female but cephalic region lighter. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart, 2.1 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Second tibia thicker than first, both first and second with macrosetae. Total length 5.2 mm. Carapace 2.9 mm long, 2.1 wide, 1.1 behind lateral eyes. First femur 2.7 mm, patella and tibia 3.5, metatarsus 3.0, tarsus 1.1. Second patella and tibia 3.1 mm, third 1.7, fourth 2.1.

Note. Males and females are commonly collected together.

Variation. Total length of females 7.2 to 11.1 mm, males 4.2 to 7.2. Illustrations were made from specimens from Tabasco State, Mexico.

Diagnosis. In ventral view the epigynum is twice as wide as long and has posterior swellings on each side (Fig. 2); in related species *M. dubia* (Fig. 16) and *M. bahama* (Fig. 9), it is narrower and lacks these swellings. Males are separated from *M. dubia* and *M. bahama* by the soft prong parallel to the sclerotized prong of the terminal apophysis (at 1 hr in Fig. 6), which is absent in the other two. The distribution of *M. wittfeldae* is allopatric with respect to related species (Map 2A).

Natural History. Specimens were collected under eaves of buildings and in brush and are commonly found in mud-dauber wasp nests.

Distribution. From southeastern United States, Virginia to Costa Rica. Its distribution does not overlap that of *M. bahama* and *M. dubia* (Map 2A). United States and some Mexican records on Map 2 come from Levi (1977).

Specimens Examined. MEXICO *Tamaulipas:* Ciudad Mante (AMNH); Tampico (AMNH). *San Luis Potosí:* Tamazuchale (AMNH, CAS); Valles (AMNH). *Zacatecas:* Tabasco (MCZ). *Nayarit:* Tepic (AMNH); 27 km S Acaponeta (CAS). *Colima:* Santiago, NW Manzanillo (AMNH). *Veracruz:* Acayucan (CAS); Catemaco (AMNH, CAS); 7.5 km W Catemaco; 17 km W Cerro Azul; Córdoba; Fortín de las Flores; Jalapa; La Palma; Lago Catemaca (all AMNH); Mocambo (CAS); Papantla; Tecolutla (all AMNH); Veracruz (AMNH, MCZ); Orizaba (MCZ). *Guerrero:* 13 km W Acapulco (AMNH). *Oaxaca:* Tehuantepec; 3.2 km NE Tehuantepec (all AMNH). *Tabasco:* Villa Hermosa (AMNH). *Yucatan:* Chetumal (MCZ). *Chiapas:* Palenque Ruins (MCZ); Prusia (AMNH). BELIZE *Stann Creek:* Dangriga (MCZ); 80 km S Stann Creek (MCZ); Twin Cays, W of Swamp Dock (USNM). GUATEMALA Antigua; Mocá; Suchitepequez; San Julian; Tiquizate; Variedades; Zacapa (all AMNH). HONDURAS Lancetilla, nr. E Tela (MCZ). NICARAGUA Lago Jiloá (SR). COSTA RICA *Cartago:* Turrialba (MCZ). *Guanacaste:* 4 km NW Cañas (MCZ); nr. Cañas (MCZ). *San José:* San José, common in city (AMNH, MCZ).

Metazygia bahama new species
Figures 8–14; Map 2A

Holotype. Male holotype, one male, two female paratypes from South Bimini, Bahama Islands, June 1951 (M. A. Cazier), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Female paratype. Carapace orange-brown with sides of thoracic region orange. Chelicerae red-brown. Labium, endites dark orange. Sternum, coxae, legs orange. Dorsum of abdomen with pairs of black brackets (Fig. 12); venter light gray without marks. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 2 diameters from laterals. Posterior median eyes 0.3 diameter apart, 4 diameters from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. Total length 8.0 mm. Carapace 3.9 mm long, 2.7 wide, 1.7 behind lateral eyes. First femur 2.9 mm, patella and tibia 3.7, metatarsus 2.5, tarsus 1.1. Second patella and tibia 3.4 mm, third 2.1, fourth 2.7.

Male holotype. Color as in female. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart, 2.2 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Second tibia slightly thicker than first, with stronger macrosetae. Abdomen widest in middle. Total length 5.1 mm. Carapace 2.8 mm long, 2.1 wide, 1.1 behind lateral eyes. First femur 2.8 mm, patella and tibia 3.7, metatarsus 2.8, tarsus 1.1. Second patella and tibia 3.1 mm, third 1.7, fourth 2.2.

Note. Males and females were collected together.

Variation. Total length of females 6.7 to 10.7 mm, males 4.8 to 5.7. Illustrations were made from the male holotype and a female paratype collected with it.

Diagnosis. Epigynum of the female (Fig. 9) is narrower than that of *M. wittfeldae* in ventral view (Fig. 2), and the posterior median plate is wider dorsally (at 6 hr in Fig. 10) than that of *M. dubia* (at 6 hr in Fig. 17) in posterior view. The male differs from both of these species by having a spine on the subterminal apophysis (at 1 hr in Fig. 13 and center of Fig. 14).

Natural History. This species probably has habits similar to *M. wittfeldae* and *M. dubia*.

Distribution. Bahama Islands. The distribution does not overlap that of *M. dubia* and *M. wittfeldae* (Map 2A).

Paratypes. From type locality: June 1950, 6♀, 1♂, imm. (M. A. Cazier, F. Rindge, AMNH); May 1951, 5♀, 4♂, imm. (M. Cazier, W. J. Gertsch, AMNH); June 1951, 30♀, 1♂, imm. (M. A. Cazier; C., P. Vaurie, AMNH); July 1951, 1♂ (C., P. Vaurie, AMNH).

Specimen Examined. BAHAMA ISLANDS Dog Key, N Andros Island, 13 May 1904, 1♂ (AMNH).

Metazygia dubia (Keyserling)
Plate 1; Figures 15–21; Map 2A

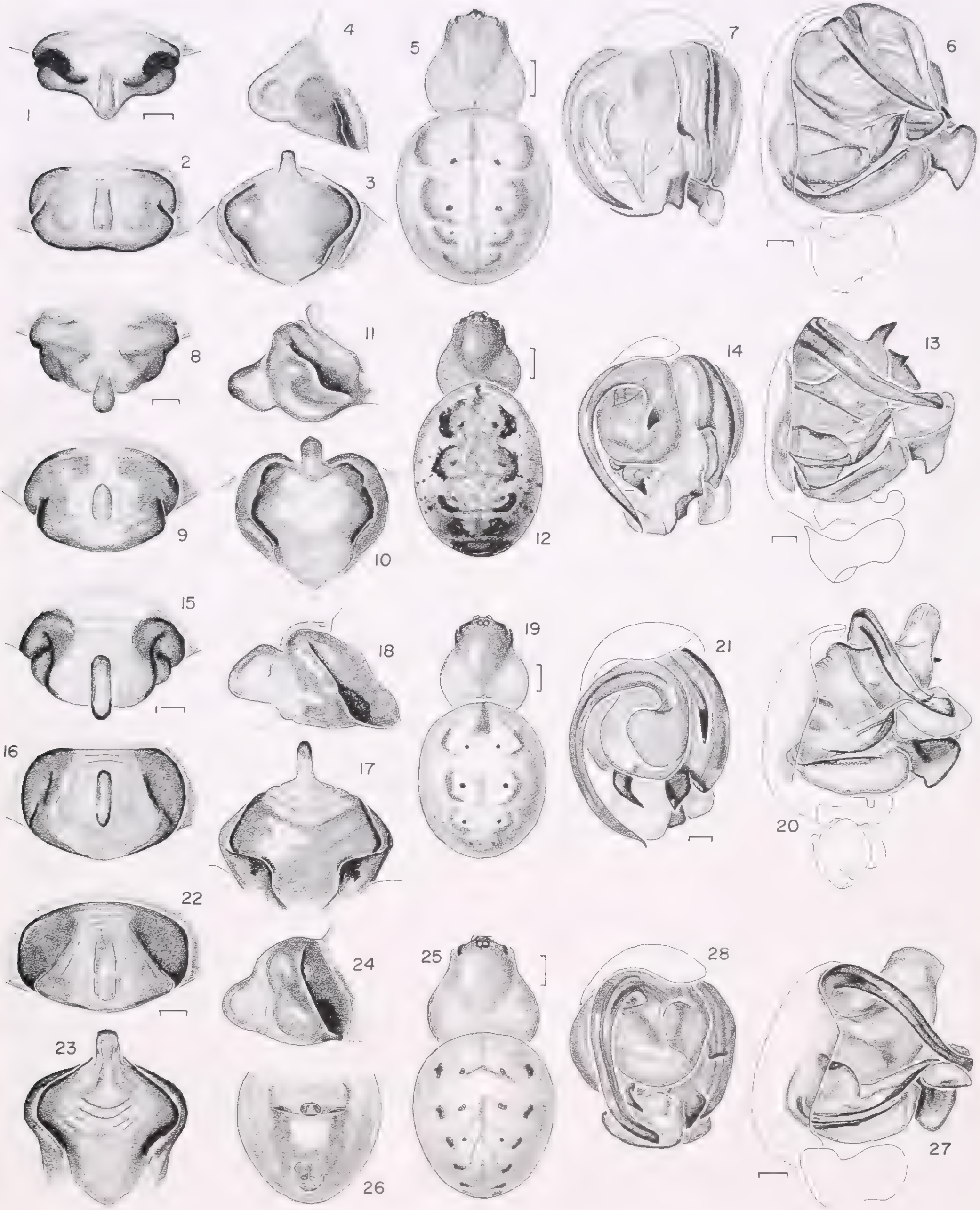
Epeira dubia Keyserling, 1864: 123, pl. 4, figs. 12, 13, ♀. Two female syntypes from Sta. Fé de Bogota, N. Granada [Bogotá, Colombia], in BMNH, examined. Keyserling, 1892: 187, pl. 9, fig. 138, ♀.
Epeira moraballii Hingston, 1932: 363, figs. 53, 54, web. Specimens from the Essquibo River, Guyana, lost [not in BMNH]. NEW SYNONYMY.
Aranea dubia:—Roewer, 1942: 841.
A. moraballii:—Roewer, 1942: 847.
Araneus moraballicus Bonnet, 1955: 546.
Metazygia dubia:—Levi, 1991a: 179.

Synonymy. Hingston's *E. moraballii* is synonymized with *M. dubia* because Hingston described the proximity of the posterior median eyes, the oval abdomen, and the *Zygiella x-notata*-like web. Also, only a few Guianan *Metazygia* are 11 mm total length. (The other large *Metazygia, M. laticeps,* has spinnerets anterior of the posterior tip, a fact noticed by Hingston for his *Epeira folisecens,* but not here.)

→

Figures 1–7. *Metazygia wittfeldae* (McCook). 1–5, female. 1–4, epigynum. 1, anterior. 2, ventral. 3, posterior. 4, lateral. 5, dorsal. 6, 7, left male palpus. 6, mesal. 7, apical.

Figures 8–14. *M. bahama* n. sp. 8–12, female. 8–11, epigynum. 8, anterior. 9, ventral. 10, posterior. 11, lateral. 12, dorsal. 13, 14, male palpus. 13, mesal. 14, apical.



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Figures 15–21. *M. dubia* (Keyserling). 15–19, female. 15–18, epigynum. 15, anterior. 16, ventral. 17, posterior. 18, lateral. 19, dorsal. 20, 21, male palpus. 20, mesal. 21, apical.

Figures 22–28. *M. pimentel* n. sp. 22–26, female. 22–24, epigynum. 22, ventral. 23, posterior. 24, lateral. 25, dorsal. 26, abdomen, ventral. 27, 28, male palpus. 27, mesal. 28, apical.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Bonnet (1955: 466) lists the name *Epeira dubia* erroneously as a synonym of *Araneus cornutus* [= *Larinioides cornutus* (Clerck 1758)].

Description. Female from Gamboa, Panama. Carapace brown, sides of thoracic region orange. Chelicerae brown. Labium, endites light brown. Sternum orange. Coxae light orange, legs orange. Dorsum of abdomen whitish with gray marks (Fig. 19); venter light gray without marks. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes their diameter apart, two diameters from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 9.5 mm. Carapace 4.1 mm long, 2.9 wide, 2.2 behind lateral eyes. First femur 3.4 mm, patella and tibia 4.0, metatarsus 3.0, tarsus 1.2. Second patella and tibia 3.8 mm, third 2.1, fourth 3.3.

Male from Gamboa. Color as in female, but carapace all orange. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes their diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 6.7 mm. Carapace 3.5 mm long, 2.5 wide, 1.5 behind lateral eyes. First femur 3.5 mm, patella and tibia 4.4, metatarsus 3.7, tarsus 1.4. Second patella and tibia 3.8 mm, third 2.1, fourth 2.7.

Note. Males and females were collected together.

Variation. Total length of females 7.2 to 11.7 mm, males 4.8 to 6.2. The abdomen may have dark marks or sometimes none at all. The scape is torn off the epigynum in some females. The epigynum of a female from Depto. Huila, Colombia, is heavily sclerotized. A male from Venezuela had the tegulum spine short. Illustrations were made from a female and male from Gamboa, Panama; the specimen on Plate 1 is from Negril, Jamaica.

Diagnosis. The *Metazygia dubia* epigynum (Fig. 16) is narrower in ventral view than that of *M. wittfeldae* (Fig. 2) and lacks the swelling on each side. It has a narrower scape (Figs. 16, 17) than that of *M. bahama* (Figs. 9, 10). Males can be separated from the more northern *M. wittfeldae* by the distal comb-like projection of the male terminal apophysis (at 1 hr in Fig. 20, center of Fig. 21) and by the long black spine on the tegulum (at 3 hr in Fig. 21).

Natural History. This species was collected from disturbed areas outside and sometimes inside buildings. It was found under bark in Cuba and was collected from coral just above the high tide mark in Jamaica; from pasture and from dense vegetation in Jamaica; on a wire fence at Coamo, Puerto Rico; and under a roof overhang and on a boat dock on Barro Colorado Island, Panama. Specimens from Galapagos were found in seashore vegetation. The spiders are nocturnal and sit in a silk retreat during the day. There is no signal line to the retreat. The vertical web is rebuilt every evening and has a partly closed hub (Lubin, personal communication). Some specimens come from mud-dauber wasp nests.

Distribution. Costa Rica, West Indies to Brazil and Peru and Galapagos Islands. It does not overlap *M. wittfeldae* (Map 2A).

Specimens Examined. COSTA RICA *Limón:* Limón (DU). PANAMA *Herrera:* Sarigua (MIUP). *Coclé:* Río Hato (MIUP). *Colón:* Santa Rosa (AMNH). *Panamá:* very common (AMNH, MIUP, MCZ). CUBA *Archip. Canarreos:* Cayo Cantiles, Bajo Corteza (IESC); Cayo Rosario, Bajo Corteza (IESC); Cayo Avalos (MNHNC). JAMAICA very common (AMNH, MCZ). HISPANIOLA *Dominican Republic: Samaña:* Las Terrenas (MNSD). *Independencia:* Baño de Zorsa (MNHNC); betw. Neiba and Duvergé (MNSD). *Distrito Nacional:* Acuario Nacional, Santo Domingo (MNSD). PUERTO RICO Laguna Cartagena, 10 km SW Lajas (MCZ); Baños de Coamo (MCZ). CURAÇAO Hato (AMNH). VENEZUELA *Sucre:* Cumaná (MCN). *Monagas:* Caripito (AMNH). *Bolívar:* Canaima [?Canaimé] (AD). COLOMBIA *Magdalena:* Ciénaga (IBNP); Pozo Colorado, 11 km W Santa Marta (AMNH); San Pablo (IBNP). *Atlántico:* Barranquilla (AMNH, IBNP). *Antioquia:* Mutatá (MCZ). *Huila:* 10 km E Santa Leticia, Finca Meremberg, 2,300 m (MCZ). ECUADOR *Sucumbíos:* Cuyabeno

Reserv. (MCZ). *Pastaza:* Río Pastaza, Río Verde, Mara Trail, 1,200 m (AMNH). *Guayas:* 3 km NE La Libertad (CAS). *Galapagos Isl.:* W coast Albemarle Isl. (AMNH); Bahia Borrero, Santa Cruz (MCZ). PERU *Libertad:* Pacasmayo (PAN); Guadalupe (PAN). BRAZIL *Amazonas:* Rio Autás, Sta. Amélia (NRMS). *Ceará:* Pacajus Guarani, 3 July 1972, 2♀ (Exped. Acad. Bras. Cienc., MZSP 12408).

Metazygia pimentel new species
Figures 22–28; Map 2D

Holotype. Male holotype and four female paratypes from Pimentel, Depto. Lambayeque, Peru, 21 Sept. 1988 (D. Silva D.), in MUSM; one paratype in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female paratype. Carapace orange, darkest in eye region. Chelicerae dark orange-brown Labium, endites, sternum light orange. Coxae light orange, legs orange. Dorsum of abdomen whitish with five pairs of black spots (Fig. 25); venter with indistinct white patch surrounded by dusky area (Fig. 26). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 2.2 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.7 diameter of anterior median eye. Total length 8.2 mm. Carapace 4.5 mm long, 3.4 wide, 2.1 behind lateral eyes. First femur 3.4 mm, patella and tibia 4.1, metatarsus 2.7, tarsus 1.2. Second patella and tibia 3.8 mm, third 2.5, fourth 3.4.

Male holotype. Color as in female but white patch in dusky area on venter of abdomen is more distinct. Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7 diameter, posterior laterals 0.6. Anterior median eyes 0.4 diameter apart, 1.2 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 5.7 mm. Carapace 3.1 mm long, 2.4 wide, 1.4 behind lateral eyes. First femur 2.9 mm, patella and tibia 3.7, metatarsus 2.7, tarsus 1.2. Second patella and tibia 3.0 mm, third 1.9, fourth 2.3.

Note. Males and females were collected together.

Variation. Total length of males 5.7 to 6.3. Illustrations were made from the type specimens.

Diagnosis. The median, less sclerotized triangular area of the epigynum is more pointed (Fig. 22) than that of *M. dubia* (Fig. 16). The male has a comb-like projection of the subterminal apophysis (at 1 hr in Fig. 27) but lacks the spine on the tegulum that is present in *M. dubia* (at 3 hr in Fig. 21). The venter of the abdomen has a white patch (Fig. 26) absent in similar species.

Natural History. Specimens were abundant in branches of locust "algarrobos," *Prosopis*, a leguminous tree growing in sand dunes in Peru, and dry to very dry tropical forest in Venezuela.

Distribution. Venezuela, Peru in arid areas (Map 2D).

Specimen Examined. VENEZUELA *Falcón:* Paraguana Peninsula, 6 km W Nuevo Pueblo, 26 Nov.–4 Dec. 1960, 1♂ (A. L. Markezich, MCZ).

Metazygia patiama new species
Figures 29–34; Map 2D

Holotype. Female holotype from Fazenda Matiapá, Camacan, Bahia, Brazil, 16 Oct. 1978 (J. S. Santos), in MCN no. 11116; male paratype, same locality and collector, 14 Oct. 1978, in MCN no. 10182. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange. Chelicerae orange-brown. Labium, endites dark orange. Sternum orange. Coxae light orange; legs dark orange, distal parts of articles darker. Dorsum of abdomen setose, with anterior pair of dark patches on dusky white and posterior quarter dark gray (Fig. 32). Venter black, fading toward sides. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 1.2 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.4 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 5.6 mm. Carapace 2.8 mm long, 2.2 wide, 1.4 behind lateral eyes. First femur 2.5 mm, patella and tibia 2.7, metatarsus 1.9, tarsus 0.9. Second patella and tibia 2.6 mm, third 1.6, fourth 2.3.

Male paratype. Color light orange, except for abdomen, which has tiny white pigment spots dorsally and lacks all gray or black marks. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 diameter apart, 0.8 diameters from laterals. Posterior median eyes 0.2 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.4 mm. Carapace 2.3 mm long, 1.6 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.5, metatarsus 1.7, tarsus 0.7. Second patella and tibia 2.3 mm, third 1.3, fourth 1.6.

Note. Males and females were collected at the same locality.

Variation. Total length of females 5.6 to 5.7 mm. Illustrations were made from the type specimens.

Diagnosis. The epigynum (Fig. 29) is wider than that of *M. pimentel* in ventral view (Fig. 22), and in posterior view (Fig. 30) the lateral plates appear wider than those of *M. pimentel* (Fig. 23) and *M. dubia* (Fig. 17). The male palpus (Figs. 33, 34) lacks the comb-like projection of the terminal or subterminal apophysis found in *M. dubia* (at 1 hr in Fig. 20) and *M. pimentel* (at 1 hr in Fig. 28) and also lacks the spine on the tegulum. The pattern on the abdomen (Fig. 32) is not a complete folium as in related species.

Natural History. Specimens were collected at night in Peru.

Distribution. Amazon region of Peru to Bahia State, Brazil (Map 2D).

Specimen Examined. PERU *Madre de Dios:* Zona Reservada de Manu, Puesto de Vigilancia Pakitza, 6 Oct. 1987, 1♀ (D. Silva D., J. Coddington, USNM).

Metazygia ipago new species
Figures 35–38; Map 2D

Holotype. Female holotype from Igarapeaçu, igapó capim flutuante (periodically flooded forest), Est. Pernambuco, Brazil, 12 July 1980, in MNRJ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, cephalic region dark orange. Chelicerae dark orange. Labium, endites dark orange. Sternum orange. Coxae light orange, legs orange. Dorsum of abdomen with a faint gray folium on white (Fig. 38); venter with some white pigment spots on light gray behind epigynum. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 1.2 diameters from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 6.8 mm. Carapace 3.4 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 3.1 mm, patella and tibia 4.0, metatarsus 2.7, tarsus 1.1. Second patella and tibia 3.5 mm, third 1.9, fourth 2.7.

Diagnosis. In ventral view there is a groove to each side of the median area of the epigynum (Fig. 35). The groove is absent in the epigynum of *M. patiama* (Fig. 29) and similar species.

Metazygia zilloides (Banks)
Figures 39–47; Map 2G

Epeira zilloides Banks, 1898: 255, pl. 15, fig. 2, ♀, ♂. Three female, one male, and one juvenile syntype from Tepic, Nayarit, Mexico, in MCZ, examined.

Aranea dilatata F. P.-Cambridge, 1904: 513, pl. 49,

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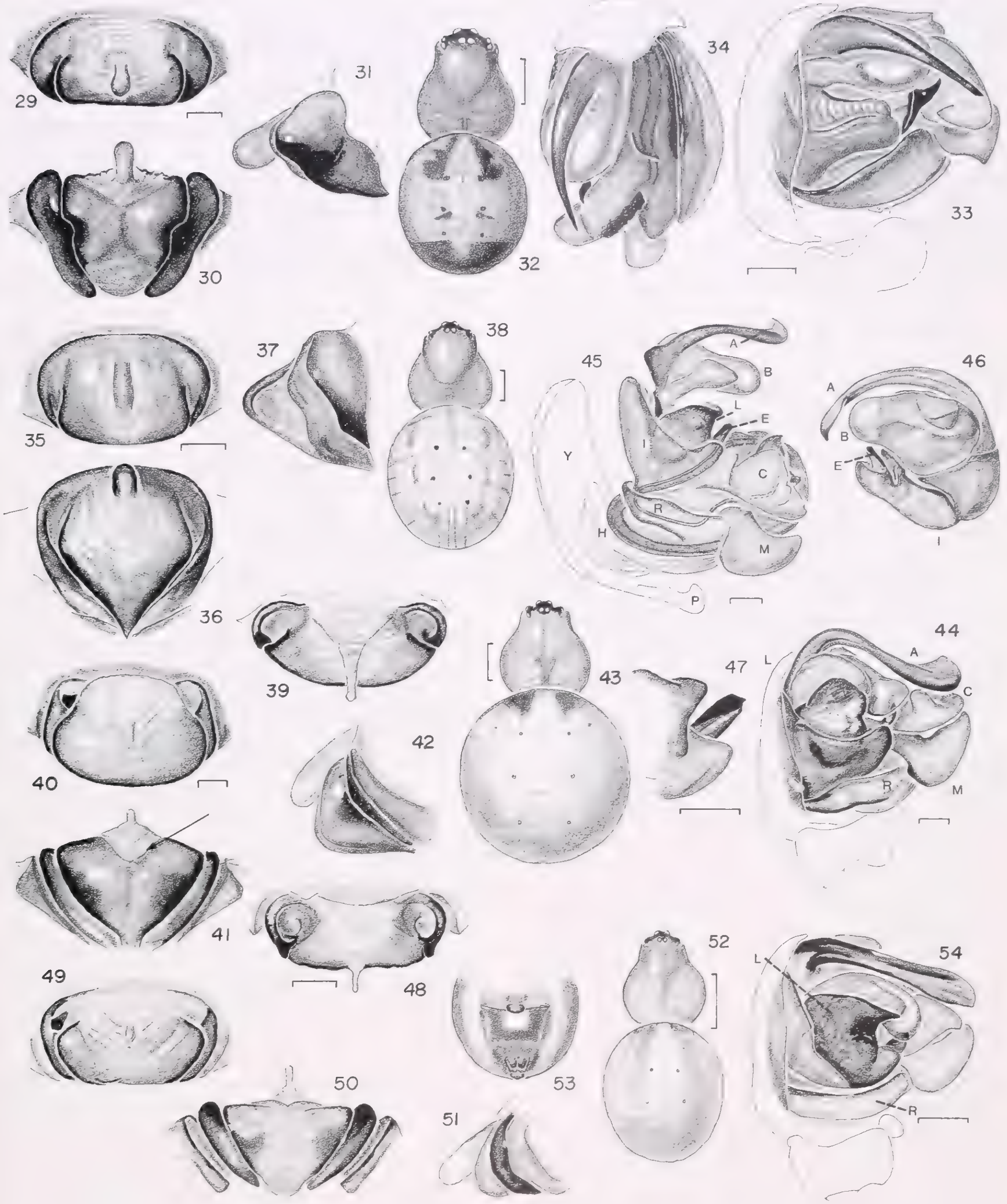
Figures 29–34. *Metazygia patiama* n. sp. 29–32, female. 29–31, epigynum. 29, ventral. 30, posterior. 31, lateral. 32, dorsal. 33, 34, left male palpus. 33, mesal. 34, apical.

Figures 35–38. *M. ipago* n. sp., female. 35–37, epigynum. 35, ventral. 36, posterior. 37, lateral. 38, dorsal.

Figures 39–47. *M. zilloides* (Banks). 39–43, female. 39–42, epigynum. 39, anterior. 40, ventral. 41, posterior. 42, lateral. 43, dorsal. 44–46, male palpus. 44, mesal. 45–47, pulled apart. 45, mesal. 46, dorsal, cymbium removed. 47, embolus and lamella.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Figures 48–54. *M. keyserlingi* Banks. 48–53, female. 48–51, epigynum. 48, anterior. 49, ventral. 50, posterior. 51, lateral. 52, dorsal. 53, abdomen, ventral. 54, male palpus, mesal.

Abbreviations. A, terminal apophysis; B, blister-like subterminal apophysis; C, conductor; E, embolus; H, hematodocha; I, stipes; L, embolus lamella; M, median apophysis; P, paracymbium; R, radix; Y, cymbium.

Scale lines. 1.0 mm, genitalia 0.1 mm.

fig. 9, ♂. Male lectotype designated Levi, 1977: 92 from Guatemala, in BMNH, examined. Roewer, 1942: 841. Synonymized by Levi, 1977.
Metazygia albonigra:—Bryant, 1940: 339, figs. 107–109, 111, ♀, ♂. Erroneous determination, not *Larinia albonigra* Franganillo.
Aranea zilloides:—Roewer, 1942: 857.
Araneus pallidulus:—Kraus, 1955: 24, fig. 66, ♀. Erroneous determination.
Araneus dilatatus:—Bonnet, 1955: 497.
Araneus zilloides:—Bonnet, 1955: 632.
Metazygia zilloides:—Levi, 1977: 92.

Description. Nontype female from Tepic, Nayarit, Mexico. Carapace orange, dusky in midline. Chelicerae, labium orange-brown. Endites, sternum orange, sides darker. Coxae, legs orange, distal ends of femora and tibiae darker. Dorsum of abdomen with white pigment spots and anterior black marks (Fig. 43); venter with white pigment spots. Eyes subequal. Anterior median eyes 0.8 diameter apart, 1.2 diameters from laterals. Posterior median eyes 0.3 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 7.4 mm. Carapace 3.0 mm long, 2.6 wide, 1.3 behind lateral eyes. First femur 3.6 mm, patella and tibia 4.6, metatarsus 3.1, tarsus 1.1. Second patella and tibia 3.7 mm, third 2.1, fourth 3.0.

Male from Tepic, Mexico. Color as in female, but abdomen darker with posterior transverse bars, and venter with a transverse white patch behind genital groove, which is surrounded by black. Posterior median eyes same diameter as anterior medians, laterals 0.9 diameter. Anterior median eyes 0.9 diameter apart, 1 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.8 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.8 mm. Carapace 2.6 mm long, 2.1 wide, 1.0 behind lateral eyes. First femur 3.2 mm, patella and tibia 4.5, metatarsus 3.6, tarsus 1.1. Second patella and tibia 3.4 mm, third 1.7, fourth 2.4.

Note. Males and females were collected together.

Variation. Total length of females 3.8 to 6.7 mm, males 3.0 to 5.0. Illustrations were made from nontype specimens from Tepic, Mexico.

Diagnosis. Females are difficult to separate from *M. keyserlingi.* The embolus part stuck in the opening is smaller (Fig. 40), and there is a median ventral groove in posterior view of the epigynum (arrow in Fig. 41). The male differs from that of *M. keyserlingi* (Fig. 54) by the round shape of the embolus lamella (L in Fig. 44).

Natural History. Specimens were collected in second-growth forest edge in Mexico and from beach grape, in a hotel, and in a citrus orchard and pasture in Jamaica. Others came from a *Sceliphron* wasp nest in Jamaica.

Distribution. Florida, central Texas to Honduras, Bahamas, Cuba, Cayman Islands, and Jamaica (Map 2G). United States and some Mexican records of Map 2 come from Levi (1977).

Specimens Examined. MEXICO *Tamaulipas:* Limón (AMNH); Mante (AMNH). *Nuevo León:* Linares (AMNH): Los Cristales (AMNH). *San Luis Potosí:* Tamazunchale (AMNH); Valles (AMNH). *Nayarit:* 3 km N Compostela (AMNH); Tepic (AMNH). *Jalisco:* Chapala (CAS); Puerto Vallarta (AMNH); Tizapán (AMNH). *Veracruz:* Catemaco (AMNH); Lago Catemaco (AMNH); Río Blanco (MCZ); 4 km N Sontecomapan (REL); Veracruz (USNM). *Hidalgo:* Ixmiquilpan, Río Tula (AMNH). *Distrito Federal:* (AMNH). *Michoacan:* Jiquilpan (AMNH); Lago Chapala (AMNH); Ciudad Michoacan (AMNH). *Morelos:* Cuernavaca (AMNH, MCZ); Tehuixtla (AMNH). *Oaxaca:* Temascal (MCZ); Tolosa (AMNH). *Tabasco:* 3 km NE Comalcalco (AMNH); Villa Hermosa (AMNH). *Campeche:* Ciudad del Carmen (AMNH). *Yucatan:* Chetumal (MCZ); Chicxulub (CAS). *Chiapas:* N Arriaga Mtns. (AMNH); Cacahuatán (AMNH); 24 km SW Cintalapa (AD); 45 km SE Comitan (AMNH); Las Cruces (AMNH); Mapastepec (AMNH); Prusia (AMNH); Tonala (AMNH). GUATEMALA *Guatemala:* Amatitlán (AMNH). *Quiché:* Chichicastenango (AMNH). *Sacatepéquez:* Antigua (AMNH); Capetillo, 1,500 m (AMNH). *Suchitepéquez:* Mocá (AMNH); Nebaj (AMNH); San Julian (AMNH); Variedades, 300 m (AMNH). *Chimaltenango:* Yepocapa (AMNH); San Pedro (AMNH). EL SALVADOR Candelaria (AMNH). HONDURAS Copán (AMNH); 27 km S Tegucigalpa (MCZ). BAHAMA ISLANDS *Andros Island:* Coakley Town (AMNH). CUBA *Pinar del Río:* Cabañas (AMNH); S Pinar del Río (AMNH); San Vicente (AMNH). *La Habana:* Habana (MCZ, USNM). *Matanzas:* Ciénaga de Zapata (MCZ); Matanzas (AMNH). *Villa Clara:* Vega Alta (MCZ). *Cien-*

fuegos: Soledad (MCZ); Trinidad Mtns., Mina Carlota (MCZ); Topes de Collantes (AMNH). *Camagüey:* Agramonte (AMNH); San Blas (MCZ). *Holguin:* Banes (AMNH); Valle de Maybe (MNHNC). *Santiago:* Siboney (AMNH); Santiago (AMNH); coast below Pico Turquino (MCZ). CAYMAN ISLANDS Grand Cayman (MCZ). JAMAICA Christiana (AMNH); Claremont (MCZ); Evanton (MCZ); Fort Henderson (AMNH); Hope Gardens (AMNH); Kingston (MCZ); Long Mtn. (MCZ); Lucea (AMNH); Mandreville (AMNH); Mona (MCZ); Negril (MCZ); Old Harbour (MCZ); Port Henderson (MCZ); 1 km E Reading (MCZ); Spanish Town (MCZ).

Metazygia keyserlingi Banks
Plate 1; Figures 48–54; Map 2G

Metazygia keyserlingi Banks, 1929: 94, pl. 4, fig. 63, ♀. Five female syntypes from Barro Colorado Island, Canal Zone [Lago Gatún, Panamá Prov., Panama], in MCZ, examined. Roewer, 1942: 868. Bonnet, 1957: 2820.

Synonymy. Banks designated two vials with females as types, two females collected on 20–24 June and three females on 13 July (both without year). This species had been erroneously synonymized with *M. zilloides* (Levi, 1977). When describing *M. keyserlingi,* Banks compared it to *M. pallidula* but not to his own *M. zilloides,* which is more similar to *M. keyserlingi* than is *M. pallidula.*

Description. Female from Barro Colorado Island. Carapace orange. Chelicerae, labium, endites orange. Sternum orange. Legs orange. Dorsum of abdomen whitish with two indistinct black longitudinal bands (Fig. 52). Venter with some white pigment behind epigynum, dark dusky on each side between epigynum and spinnerets, and with a faint white line on each side (Fig. 53). Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.5 mm. Carapace 1.9 mm long, 1.5 wide, 0.9 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.5, metatarsus 1.7, tarsus 0.7. Second patella and tibia 1.9 mm, third 1.1, fourth 1.7.

Male from Barro Colorado Island. Color as in female. Eyes subequal. Anterior median eyes 1.2 diameters apart, 1 diameter from laterals. Posterior median eyes 0.5 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 3.6 mm. Carapace 1.8 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 2.0 mm, patella and tibia 2.5, metatarsus 2.0, tarsus 0.8. Second patella and tibia 2.0 mm, third 1.0, fourth 1.4.

Note. Males and females were collected together.

Variation. Total length of females 3.5 to 5.7 mm, males 2.3 to 3.6. Illustrations were made from specimens collected from the type locality: Barro Colorado Island, Gatún Lake, Panama. The web photograph (Pl. 1) is also from Barro Colorado Island, Panama.

Diagnosis. The white patch on the venter of the abdomen (Fig. 53) is more discrete and the groove present in *M. zilloides* (arrow in Fig. 41) is smaller or absent (Fig. 50). The male can be told from *M. zilloides* (Fig. 44) by the embolus lamella (L in Fig. 54), which is pointed "above" the embolus. The females are difficult to separate from *M. zilloides,* but all the ones collected with males had the central swollen part of the epigynum 0.32 mm wide, whereas those of *M. zilloides* had the swollen part of the epigynum 0.40 mm wide. The epigynum of *M. keyserlingi* has a slightly smaller scape than that of *M. zilloides.*

Natural History. This species was collected in moist tropical forest in Costa Rica, in leaf litter in Panama, and in a garden in Cali, Colombia. Males are uncommon in collections.

Distribution. Costa Rica to southern Colombia, Trinidad (Map 2G).

Specimens Examined. COSTA RICA *Limón:* Cahuita, 31 Mar. 1979, 2♀ (J. Coddington, MCZ). *Puntarenas:* Osa, Parque Nacional Corcovado, 15 Aug. 1978, 1♀ (J. Coddington, MCZ); Manuel Antonio National Park, 24–26 Mar. 1983, 2♀, 1♂ (D. Ubick, DU); Osa Peninsula, Llorona Station, 6 Aug. 1980, 1♀ (J. Coddington, USNM). PANAMA *Colón:* Fort Sherman, Aug. 1939, 1♀ (A. M. Chickering, MCZ); Fort Gulick, 23 Feb. 1980, 1♂ (Harlan, AMNH). *Panamá:*

Barro Colorado Island, Lago Gatún, very common, 1♀, 1♂ (AMNH, MCZ); Pipeline Road, Soberania Natl. Park, June 1978, 5♀ (F. Vollrath, MCZ), 7 Aug. 1983, 1♀ (H., L. Levi, MCZ); Toboga Island, 23 Aug. 1946, 2♀ (N. L. H. Krauss, AMNH). TRINIDAD *St. George Co.:* Simla, 6.4 km N Arima, 2 May 1967, 1♀ (C. T. Collins, AMNH); Arima Valley, 10–22 Feb. 1964, 1♂ (P. Wygodzinsky, AMNH). COLOMBIA *Valle:* Cali, 19 Oct. 1969, 1♀, 2 Oct. 1969, 1♀; Río Jamundi, 1,000 m, 18 km S Cali, 9 July 1969, 1♀, 14 Jan. 1970, 1♀, 17 June 1970 (all W. Eberhard, MCZ); 4 Mar. 1973, 3♀ (W. Eberhard, H. Levi, MCZ); 10 km N Piendamó, 1,700 m, Feb. 1974, 1♀, 1♂ (W. Eberhard, MCZ). *Nariño:* nr. Barbacoas, 20 m, 20 Mar. 1974, 1♀ (W. Eberhard 727, MCZ).

Metazygia chicanna new species
Plate 1; Figures 55–61; Map 2B

Holotype. Female holotype and female and two male paratypes from Chicanna Ruins, 8 km W Xpujii, ca. 18°32′N, 89°31′W, Campeche, Mexico, 12–14 July 1983 (W. Maddison), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, with median dusky band. Chelicerae, labium, endites, sternum orange. Coxae, legs orange. Dorsum of abdomen with two pairs of black bands, sides black (Fig. 58); venter with a central white patch (Fig. 59). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.6 diameters from laterals. Height of clypeus equals 0.6 diameter of the anterior median eyes. Total length 5.5 mm. Carapace 2.2 mm long, 1.5 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.7. Second patella and tibia 2.3 mm, third 1.3, fourth 1.9.

Male paratype. Color as in female, but legs indistinctly ringed darker, and abdomen with two pairs of longitudinal bands. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.9 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.8 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 3.5 mm. Carapace 1.9 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.6, metatarsus 2.1, tarsus 0.9. Second patella and tibia 2.1 mm, third 1.1, fourth 1.6.

Note. Males and females were collected together.

Variation. Total length of females 2.5 to 5.8 mm, males 2.5 to 4.2. Illustrations were made from paratypes; the photograph (Pl. 1) was made in Negril, Jamaica.

Diagnosis. All specimens have a white spot on the venter of the abdomen (Fig. 59). Females can be distinguished by the ventral view of the epigynum, which has a cone-shaped scape with openings on each side (Fig. 55). The scape also has a kink in lateral view (Fig. 57). Unlike other species, the male has a cone-shaped embolus lamella (at center of Fig. 60).

Natural History. The holotype came from short tropical rain forest. Other specimens came from moist forest border in Quintana Roo, Mexico, border of forest road; from roadside, on top of woody shrubs without leaves; and from beach grape in Jamaica.

Distribution. From Yucatan Peninsula, Mexico, to Honduras, Jamaica (Map 2B).

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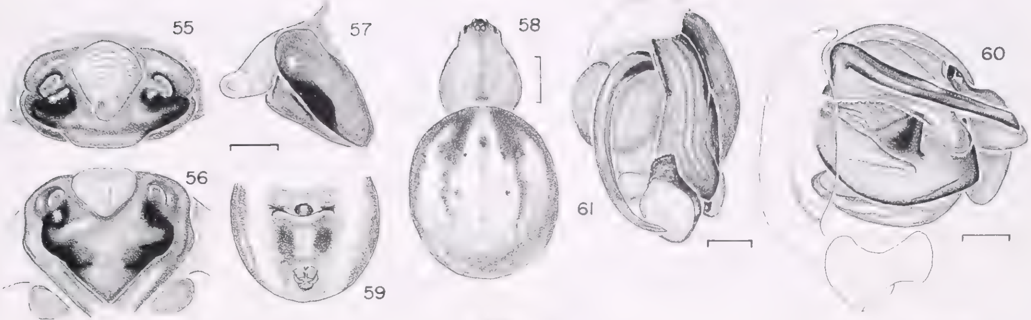
Figures 55–61. *Metazygia chicanna* n. sp. 55–59, female. 55–57, epigynum. 55, ventral. 56, posterior. 57, lateral. 58, dorsal. 59, abdomen, ventral. 60, 61, left male palpus. 60, mesal. 61, apical.

Figures 62–65. *M. tapa* n. sp., female. 62–64, epigynum. 62, ventral. 63, posterior. 64, lateral. 65, dorsal.

Figures 66–68. *M. pastaza* n. sp., male. 66, 67, male palpus. 66, mesal. 67, apical. 68, dorsal.

Figures 69–73. *M. incerta* (O. P.-Cambridge). 69–72, female. 69–71, epigynum. 69, ventral. 70, posterior. 71, lateral. 72, dorsal. 73, male palpus.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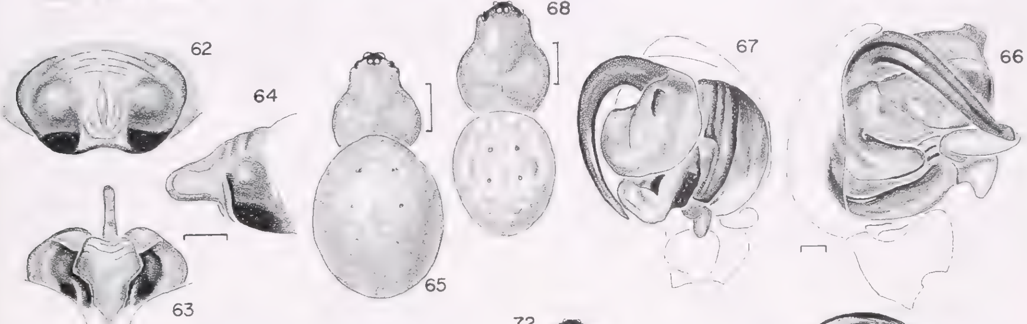
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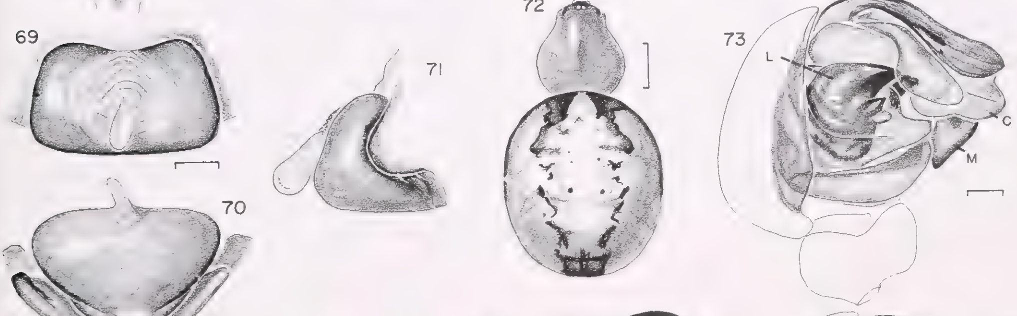
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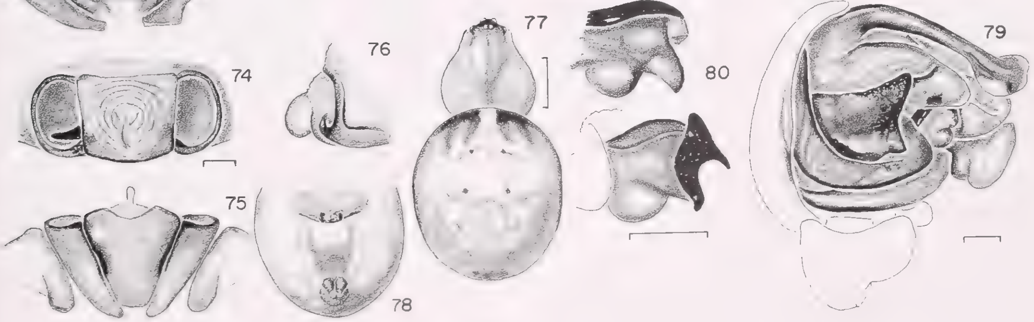
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Figures 74–80. *M. pallidula* (Keyserling). 74–78, female. 74–76, epigynum. 74, ventral. 75, posterior. 76, lateral. 77, dorsal. 78, abdomen, ventral. 79, male palpus. 80, embolus, with and without cap.

Abbreviations. C, conductor; L, embolus lamella; M, median apophysis.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Specimens Examined. MEXICO *Campeche:* Becan, 18°33′N, 89°30′W, 31 July 1991, 1♂ (W. Piel, G. S. Bodner, MCZ); Ceiba Playa [?], 2 Aug. 1949, 1♀ (C. J. Goodnight, AMNH). *Yucatan:* Chichen Itza, Nov. 1945, 1♀ (H. Wagner, AMNH). *Quintana Roo:* Chetumal, 28 June 1975, 1♂ (W. C. Sedgwick, MCZ); Chancanah Cozumel, 8 Aug. 1949, 1♀ (C. J. Goodnight, AMNH); Reserva de Sian Ka'an, km 5, 4 June 1991, many ♀, 1♂ (G. Alayón, L. F. Armas (IESC); 31 km NE Felipe Carillo Puerto, Highway 307, 17 July 1983, 1♀ (W. Maddison, R. S. Anderson, MCZ); X-Can, 6–7 June 1959, 1♀ (C., P. Vaurie, AMNH). BELIZE *Stann Distr.:* W Possum Point Biol. Sta., 16°49′N, 88°20′W, 2 July 1991, 1♀ (W. H. Piel, G. S. Bodner, MCZ). HONDURAS Lancetilla nr. Tela, July 1929, 1♀; Tela beach 26 July 1929, 1♂ (A. M. Chickering, MCZ). JAMAICA 4.8 km E May Pen, 22 Nov. 1957, 1♀ (A. M. Chickering, MCZ); Kingston, 6 Dec. 1954, 1♂ (A. M. Nadler, AMNH); Kinloss, 23 Mar. 1955, 1♀ (A. M. Nadler, AMNH); 22 km E Kingston, 11 July 1960, 1♀ (C., P. Vaurie, AMNH); Long Mtn., 22 Oct. 1957, 1♂, 26 Oct., 1♂ (A. M. Chickering, MCZ), 11 July 1960, 1♀ (C., P. Vaurie, AMNH); Negril, 23–31 Mar. 1981, 10♀, 4♂ (H., L. Levi, MCZ).

Metazygia tapa new species
Figures 62–65; Map 2B

Holotype. Female holotype and two female paratypes from Zona Reservada Tambopata, 290 m, 12°50′S, 69°17′W, hotel at night, Depto. Madre de Dios, Peru, 8 June 1988 (D. Silva D.), in MUSM, one paratype in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange. Chelicerae orange, distally brown. Labium, endites, sternum, legs orange. Abdomen whitish with white pigment spots underneath exoskeleton (Fig. 65). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.5 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.8 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.4 mm. Carapace 2.3 mm long, 1.9 wide, 1.0 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.5, metatarsus 1.6, tarsus 0.8. Second patella and tibia 2.1 mm, third 1.5, fourth 2.0.

Variation. Total length of females 4.9 to 6.0 mm. Illustrations were made from the holotype.

Diagnosis. The abdomen is oval and slightly pointed anteriorly, widest in middle (Fig. 65). *Metazygia tapa* is separated from *M. ipago* and *M. patiama* by the dark patches in ventral view of the epigynum (Fig. 62) and the narrow posterior median plate (Fig. 63).

Natural History. Specimens were collected by fogging at night in Depto. Loreto, Peru.

Distribution. Amazon drainage, Peru (Map 2B).

Paratype. PERU *Madre de Dios:* Zona Reservada Tambopata, 290 m, 12°50′S, 69°17′W, 3 June 1988, 1♀ (J. Coddington, USNM).

Specimens Examined. PERU *Loreto:* Río Samiria, 12–28 May 1990, 2♀ (T. Erwin, D. Silva D., MUSM). *Madre de Dios:* 15 km E Puerto Maldonado, 200 m, 12°33′S, 69°03′W, 21 Feb.–8 Mar. 1989, 5♀ (D. Silva D., MUSM).

Metazygia pastaza new species
Figures 66–68; Map 2B

Holotype. Male holotype from Pastaza, Depto. Loreto, Prov. Alto Amazonas, Peru, swamp plants, Aug. 1973 (J. C. Olin), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace orange, cephalic region darker orange. Chelicerae orange-brown. Labium, endites dark orange. Sternum orange. Coxae, legs orange. Dorsum of abdomen with folium as in related species (Fig. 68); venter with scattered white pigment spots. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 1.8 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.4 diameter of anterior median eye. Second tibia as thick as first. Total length 6.7 mm. Carapace 3.5 mm long, 2.7 wide, 1.6 behind lateral eyes. First femur 4.6 mm, patella and tibia 5.2, metatarsus 4.2, tarsus 1.4. Second patella and tibia 4.5 mm, third 2.1, fourth 3.1.

Note. This might be the male of *M. tapa.*

Diagnosis. The palpus of this species (Fig. 67) lacks the spine on the tegulum of

M. dubia (at 3 hr in Fig. 21) and has a smaller comb (at 1 hr in Fig. 66) than *M. pimentel* (Fig. 27). Most palpal sclerites differ slightly from those two similar species.

Metazygia incerta (O. P.-Cambridge)
Figures 69–73; Map 2J

Epeira incerta O. P.-Cambridge, 1889: 23, pl. 4, fig. 15, ♀. Female syntypes from Costa Rica, in BMNH, examined. Keyserling, 1892: 163, pl. 8, fig. 120, ♀.

Epeira fecunda O. P.-Cambridge, 1889: 26, pl. 6, figs. 9, 10, ♀, ♂. Numerous syntypes from Guatemala in BMNH, examined. Keyserling, 1892: 164, pl. 8, fig. 121, ♀, ♂. First synonymized by F. P.-Cambridge, 1904.

Epeira maculata:—Keyserling, 1892: 242. Six female and one male paralectotype from Baltimore. The female lectotype is a *Mangora* (see Levi, 1975).

Aranea incerta:—F. P.-Cambridge, 1904: 512, pl. 49, figs. 7, 8, ♀, ♂. Roewer, 1942: 845.

Araneus incertus:—Bonnet, 1955: 521. Kraus, 1955: 22, figs. 62–65, ♀, ♂.

Metazygia incerta:—Levi, 1991a: 179.

Synonymy. There are male specimens in the vial with the female syntypes of *Epeira incerta*, which may have been added later. Keyserling reports *Epeira incerta* as coming from Guatemala, but both Keyserling and O. P.-Cambridge examined the same females. Paralectotypes of *Epeira maculata* (Levi, 1975) are this species; they are marked as coming from Baltimore, but this is an erroneous G. Marx locality.

Description. Female from San José, Costa Rica. Carapace orange-brown. Chelicerae, labium, endites orange. Sternum, coxae orange, legs brown. Dorsum of abdomen black and white (Fig. 72); venter dusky, some white pigment spots in center. Eyes subequal. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 6.5 mm. Carapace 2.7 mm long, 2.0 wide, 1.1 behind lateral eyes. First femur 2.9 mm, patella and tibia 3.6, metatarsus 2.6, tarsus 0.9. Second patella and tibia 2.9 mm, third 1.7, fourth 2.4.

Male from Monteverde, Costa Rica. Color as in female, but abdomen much darker. Posterior median eyes same diameter as anterior medians, laterals 0.9 diameter. Anterior median eyes their diameter apart, their diameter from laterals. Posterior median eyes 0.3 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Endite with small, sharp tooth, palpal femur with facing tubercle. First coxa with small hook. Second tibia thicker than first, without macrosetae. Total length 4.6 mm. Carapace 2.8 mm long, 2.2 wide, 1.2 behind lateral eyes. First femur 4.4 mm, patella and tibia 5.7, metatarsus 4.5, tarsus 1.2. Second patella and tibia 4.5 mm, third 2.2, fourth 4.0.

Note. Males and females were collected together.

Variation. Total length of females 4.5 to 9.0 mm, males 3.7 to 6.3. Illustrations were made from a female from San José, Costa Rica, and male from Puntarenas Prov., Costa Rica.

Diagnosis. The female differs from other *Metazygia* species by having the epigynum in ventral view an entire, rectangular plate, not showing openings (Fig. 69): the openings are anterior of the plate and not visible in ventral view. The male differs by having two teeth on the embolus lamella (L in Fig. 73), below the lamella's sclerotized tip.

Natural History. Specimens were found in *Trypargilum nitidum* and *T. tenoctitla* wasp nests at Cañas, Costa Rica. Most observations come from R. Buskirk (personal communication, 28 Feb. 1972). The observations were made in Monteverde, 1,380 m, Costa Rica. The orb is made in tree branches about 1 m above ground. Spiders are active in the hub at night from dusk to about 30 minutes to one hour after sunrise; during the day they are in folded-leaf retreats near or attached to the orb. The orbs are rebuilt every 2 to 4 days, depending on the damage to the web. In the Monteverde area, *M. incerta* is most abundant in moist habitats such as a river valley, and in places they are only a few decimeters above the water. Individual orbs may be quite close to one another, nearly adjacent, but not continuous. Other collecting localities were rain forest, humid forest, cloud forest, a grapefruit orchard near a river, a porch at night, and mixed vegetation.

Distribution. Common from Belize to Panama (Map 2J).

Specimens Examined. BELIZE San Ignacio [17°10′N, 89°04′W] (MCZ). GUATEMALA *Petén:* E end Lago Petén Itzá (AMNH). *Alta Vera Paz:* Cobán (AMNH). HONDURAS Copan (AMNH); Lancetilla nr. Tela (MCZ); Siguatepeque, 1,100–1,200 m (AMNH). EL SALVADOR (Desague, Laguna Guija, 460 m, Kraus, 1955). NICARAGUA Granada (MCZ); Managua (JMM); Musawas, Río Waspuc (AMNH); 5 km N Matagalpa (JMM); Islas de Solentiname (JMM); 5 km E Jinotepe (JMM); 122 km S Managua, W shore Lago Nicaragua, 32 m (USNM). COSTA RICA *Heredia:* Heredia (AMNH); San José de la Montaña (DU). *Alajuela:* Grecia (AMNH); Palmares (AMNH); road to Volcán Poás, 1,500 m (MCZ). *Guanacaste:* 4 km NW Cañas, La Pacifica (MCZ); Peñas Blancas (S. Riechert, AMNH); La Pacifica, 160 km SW, Finca Palo Verde (MCZ); Tilarán (MNRJ). *Limón:* Penshurst 10 km N Cahuita (DU). *Cartago:* Cartago, 1,400 m (AMNH); Moravia (CAS); Turrialba (CAS, CUC); Paraíso (AMNH). *San José:* Braulio Carillo Natl. Park (DU); Escazú (MCZ); San José, 1,200 m (AMNH, DU, MCZ); Ciudad Universitaria (USNM); La Verbena (MCZ); San Pedro de Montes (USNM); Zapote (FSCA). *Puntarenas:* Monteverde, 1,380 m (AMNH, DU, MCZ). PANAMA *Bocas del Toro:* Changuinola (AMNH, CUC).

Metazygia pallidula (Keyserling)
Figures 74–80; Map 2E

Epeira pallidula Keyserling, 1864: 124, pl. 4, figs. 14, 15, ♀. Female holotype from St. Fé de Bogota, New Granada [Bogotá, Colombia], in BMNH, examined. Keyserling, 1892: 158, pl. 8, fig. 116, ♀.

Epeira simplicissima Keyserling, 1883: 203, pl. 15, fig. 8, ♀. Female holotype from Tumbez [Tumbes, Depto. Tumbes], Peru, in PAN, examined. Keyserling, 1892: 169, pl. 8, fig. 125, ♀. NEW SYNONYMY.

Singa mollybyrnae McCook, 1894: 229, pl. 19, fig. 1, ♀. One female from District of Columbia, United States, in ANSP, examined. Roewer, 1942: 878. Synonymized by Levi, 1972: 231.

Aranea pallidula:—F. P.-Cambridge, 1904: 514, pl. 49, fig. 13, ♀. Roewer, 1942: 849.

Aranea simplicissima:—Roewer, 1942: 852.

Araneus mollybyrnae:—Bonnet, 1955: 546.

Araneus pallidulus:—Bonnet, 1955: 562.

Araneus simplicissimus:—Bonnet, 1955: 600.

Araneus palloides Roewer, 1955: 1715. New name for *Epeira pallidula* Keyserling, thought to be preoccupied by *Araneus pallidula* Clerck, 1758 (=*Clubiona pallidula*).

Metazygia pallidula:—Levi, 1991: 179.

Synonymy. The holotypes of *Epeira pallidula* and *Singa mollybyrnae* have the same large lateral openings of the epigynum. The holotype of *S. mollybyrnae* comes from Washington, D.C., and another specimen from Biscayne Bay, Florida. Each is an erroneous G. Marx locality.

Description. Female from Chiriquí Prov., Panama. Carapace orange, cephalic area dusky. Chelicerae, labium, endites, sternum orange. Coxae, legs orange, distally darker. Dorsum of abdomen whitish with anterior pair of black marks and indistinct dusky folium (Fig. 77); venter a white transverse patch posterior to the epigynum (Fig. 78). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.2 diameter apart, 2.8 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 5.6 mm. Carapace 2.3 mm long, 1.9 wide, 1.1 behind lateral eyes. First femur 2.7 mm, patella and tibia 3.1, metatarsus 2.3, tarsus 0.9. Second patella and tibia 2.7 mm, third 1.5, fourth 2.2.

Male from Chiriquí Prov., Panama. Color as in female, but legs with indistinct dark rings and no white on venter. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.6 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.5 mm. Carapace 2.5 mm long, 1.9 wide, 0.9 behind lateral. First femur 3.5 mm, patella and tibia 4.5, metatarsus 3.7, tarsus 1.2. Second patella and tibia 3.6 mm, third 1.8, fourth 2.5.

Note. Males and females are commonly collected together.

Variation. Total length of females 3.8

to 6.5 mm, males 2.5 to 4.2. Illustrations were made from specimens from Chiriquí Prov., Panama.

Diagnosis. The large pair of ear-like depressions on the ventral view of the epigynum (Fig. 74) separates females from similar species. Males can be separated by the shape of the embolus with two rounded lobes "below" (Figs. 79, 80) and by the two pointed lobes of the embolus lamella (Fig. 79).

Natural History. Specimens were collected from a wet area near Acapulco, Mexico; from wet forest in Limón Prov., Costa Rica; on a bridge, banks of a river bed, and a rock wall in a garden in Chiriquí Prov., Panama; in a banana grove in Sullana, Peru; in light under the eaves of a house in northern Colombia; and in low shrubs and large herbs at night in Turrialba, Costa Rica. Many collections were made at night.

Distribution. From central Mexico to French Guiana and Ecuadorian and Peruvian coast (Map 2E).

Specimens Examined. MEXICO *Veracruz:* Coatzacoalcos (AMNH); Tlacotalpan (AMNH). *Guerrero:* 13 km W Acapulco (AMNH, MCZ); 2.4 km W Acapulco (AMNH); Acapulco (MCZ). *Tabasco:* Comacalco (AMNH). *Chiapas:* La Zacualpa (AMNH). EL SALVADOR San Salvador (AMNH). HONDURAS Comayagua (FSCA). NICARAGUA Managua (AMNH, CUC). COSTA RICA *Heredia:* W Alajuela (Riechert Coll.); La Selva (AMNH, MCZ). *Alajuela:* Fortuna [Río Fortuna], nr. Esparta (MCZ). *Limon:* nr. Cahuita (MCZ); 5 km E Guápiles (DU); Tortuguero Natl. Park (DU). *Cartago:* Turrialba (CAS, MCZ). *San José:* San José (MCZ); San Isidro (MCZ). *Puntarenas:* Corcovado Natl. Park, Sirena (MCZ); Jacó (MCZ); Parrita (MCZ); San Isidro del General (MCZ); Tárcoles (MCZ); 10 km N Mal País (MCZ). PANAMA *Boga del Toro:* Changuinola (MCZ). *Chiriquí:* Bambito nr. Cerro Punta, 1,400 m (CAS, MCZ); Cerro Punta (AMNH); Boquete (AMNH, MCZ); 9 km N David (USNM); David (MCZ, MIUP); La Fortuna (MCZ, MIUP); Volcán (AMNH, MCZ); Volcán Baru (FSCA). *Colón:* Gamboa (MCZ); France Field (MCZ); Frijoles (MCZ). *Coclé:* El Copé (MIUP); El Valle (AMNH, MCZ). *Panamá:* Balboa (MCZ); Barro Colorado Island (AMNH, MCZ); road to Chiva (MCZ); Cerro Azul (MIUP); Experimental Gardens (MCZ); Forest Reserve (MCZ); Madden Dam (MCZ); Pedro Miguel (MCZ); Pipeline Road (MCZ); Playa Corona nr. San Carlos (MCZ); Summit (MCZ). VENEZUELA *Delta Amacuro:* Río Orinoco delta (MCZ). GUYANA *Bartica:* Kartabo (CUC). FRENCH GUIANA St. Laurent du Maroni (PAN). COLOMBIA *La Guajira:* Río Guatapuri, 1,100 m. *Magdalena:* above Minca Valley, 880 m (IBNP); East Cerro Dunarua, 1,300 m (IBNP); Río Domachuí, 1,700 m (IBNP); Río Cordua, 800 m (IBNP); Río Frío, 530 m (IBNP); stream betw. Cerros Chivolo and Chumchuruba, 1,100 m (IBNP); Río Gaira (SMF); San Pablo (IBNP); San Sebastian de Rebango, 3,300 m, Sierra Nevada de Santa Marta (AMNH); Serra Nueva Granada, 1,310 m (IBNP). *César:* Escorpa Mission, Sierra de Parija, 1,300–1,400 m (AMNH). *Cundinamarca:* 22 km SE Caqueza (CAS) *Córdoba:* Ayapel nr. Cienaga (MCZ). *Meta:* Villavicencio (AMNH); 5 km W Villavicencio (CAS). *Antioquia:* Mutatá (MCZ). *Valle:* Cali (MCZ); Lago Colima nr. Darien (MCZ). *Nariño:* Barbacoas (MCZ). ECUADOR *Pichincha:* Santo Domingo de las Colorades (FSCA). *Manabi:* El Carmen (AMNH); road betw. Crucita and Charapoto (MCZ). *Guayas:* 4.8 km N Manglar Alto (CAS); Guayaquil (CAS); Milagro (CAS); Puná Island (CAS). *Azuay:* Jubones (CAS). *El Oro:* Buena Vista, 20 km Machala (CAS). PERU *Loreto:* Barranca (CAS). *Piura:* Negritos (CAS); Mallares, Río Chira (CAS); nr. Miramar (CAS); Porta Chuala [? Portachuelo] (CAS); 6 km W Sullana (CAS); Sullana (CAS); Las Lomas (CAS). *Lambayeque:* 10 km S Chiclayo (CAS). *Libertad:* Pacasmayo (PAN). *Lima:* Lima (CAS). *Ayacucho:* Monterrico (PAN).

Metazygia enabla new species

Figures 81–86; Map 2E

Holotype. Female holotype from Cerro de la Neblina, base camp, 140 m, 0°50′N, 66°10′W, Territ. Federal Amazonas, Venezuela, 21–28 Feb. 1985, male paratype, 9 Feb. 1985, both from low foliage (W. E. Steiner), in USNM. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace light orange, eye region black. Chelicerae distally much darker orange. Labium, endites dusky orange. Sternum, legs orange. Dorsum of abdomen with dense white pigment spots and two dark gray longitudinal bands; bands are most distinct posteriorly and become indistinct anteriorly (Fig. 84). Venter light dusky. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.2 diameter of anterior median eye. Total length 3.7 mm. Carapace 1.8 mm long, 1.4 wide, 0.8 behind lateral eyes. First femur 1.6 mm, patella and tibia 1.8, metatarsus

1.1, tarsus 0.6. Second patella and tibia 1.6 mm, third 0.9, fourth 1.4.

Male paratype. Color as in female, but orange parts slightly dusky and dark bands of dorsum of abdomen more distinct. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 2.8 mm. Carapace 1.53 mm long, 1.17 wide, 0.57 behind lateral eyes. First femur 1.43 mm, patella and tibia 1.67, metatarsus 1.14, tarsus 0.59. Second patella and tibia 1.33 mm, third 0.88, fourth 1.14.

Note. Males and females were matched because both were collected at the same locality, in the same habitat, and have similar markings: longitudinal dark bands, darkest posteriorly (Fig. 84).

Diagnosis. The female epigynum differs from that of others by the ventrally projecting median plate (at 6 hr in Fig. 81, at center of Fig. 82) and the sclerotized edge of the lateral plates, as seen on each side in ventral view (Fig. 81). The male differs by the long, exposed embolus, which is not covered by the embolus lamella (Fig. 85).

Metazygia redfordi new species
Figures 87–90; Map 2C

Holotype. Female holotype from Parque Nacional das Emas, nr. Mineiros, Est. Goiás, Brazil, associated with a termite mound, Sept.–Oct. 1981 (K. H. Redford) in MZSP ex MCZ. The species is named after the collector.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum orange. Coxae orange, legs black. Dorsum of abdomen whitish with five pairs of black patches (Fig. 90); venter black except for book-lungs and area in-between, sides black. Posterior median eyes 0.6 diameter of anterior medians, anterior laterals 0.6 diameter, posterior laterals 0.5. Anterior median eyes 0.4 diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 7.5 mm. Carapace 3.7 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 2.8 mm, patella and tibia 3.5, metatarsus 2.2, tarsus 1.1. Second patella and tibia 3.1 mm, third 2.0, fourth 2.9.

Diagnosis. The contrasting markings on the abdomen (Fig. 90) would suggest that this species belongs in *Alpaida*; the epigynum (Figs. 87–89), however, is that of a *Metazygia*. Unlike that of other species, the scape is wide anteriorly (Fig. 87). The shape of the median plate in ventral and posterior view (Figs. 87, 88) is unlike that of other species.

Metazygia isabelae new species
Figures 91–93; Map 2C

Holotype. Male holotype from Santa Isabel do Morro, Ilha do Bananal, Est. Tocantins, Brazil, June 1961 (M. Alvarenga), in AMNH. The species is named after the local saint.

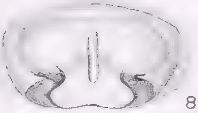
Description. Male holotype. Cephalothorax orange, the third and fourth coxae and legs lightest. Dorsum of abdomen light, with three faint, dusky, longitudinal bands (Fig. 93); venter light. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.5 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.8 diameters from laterals. Height

→

Figures 81–86. *Metazygia enabla* n. sp. 81–84, female. 81–83, epigynum. 81, ventral. 82, posterior. 83, lateral. 84, dorsal. 85–86, male left palpus. 85, mesal. 86, apical.

Figures 87–90. *M. redfordi* n. sp., female. 87–89, epigynum. 87, ventral. 88, posterior. 89, lateral. 90, dorsal.

Figures 91–93. *M. isabelae* n. sp., male. 91, 92, palpus. 91, mesal. 92, ventral. 93, dorsal.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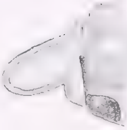
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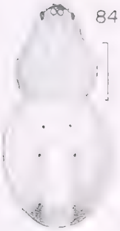
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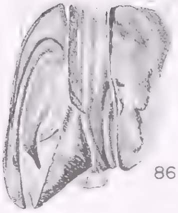
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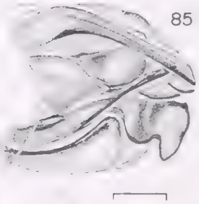
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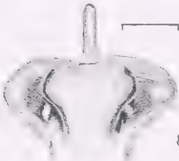
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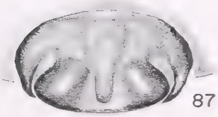
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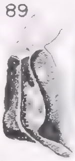
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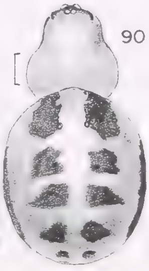
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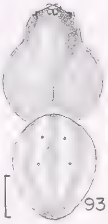
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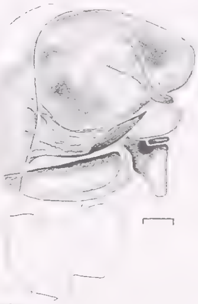
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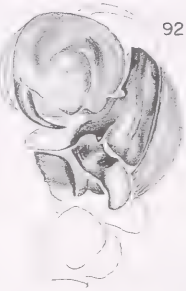
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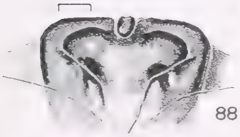
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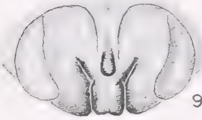
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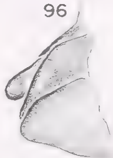
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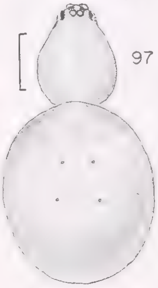
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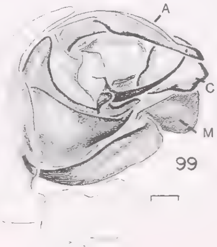
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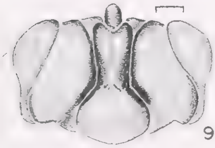
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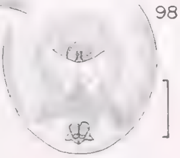
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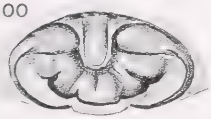
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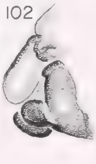
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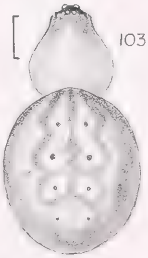
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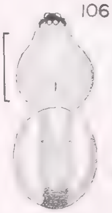
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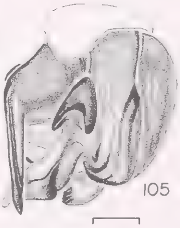
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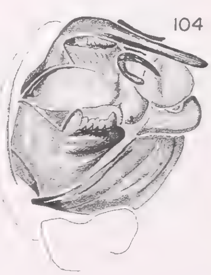
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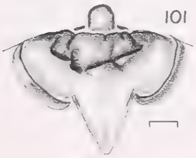
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Figures 94–99. *M. rogenhoferi* (Keyserling). 94–98, female. 94–96, epigynum. 94, ventral. 95, posterior. 96, lateral. 97, dorsal. 98, abdomen, ventral. 99, male palpus.

Figures 100–103. *M. barueri* n. sp., female. 100–102, epigynum. 100, ventral. 101, posterior. 102, lateral. 103, dorsal.

Figures 104–106. *M. jamari* n. sp., male. 104, 105, palpus. 104, ventral. 105, apical. 106, dorsal.

Abbreviations. A, terminal apophysis; C, conductor; M, median apophysis.

Scale lines. 1.0 mm, genitalia 0.1 mm.

of clypeus equals 0.6 diameter of anterior median eye. Total length 4.8 mm. Carapace 2.8 mm long, 2.1 wide, 1.1 wide behind lateral eyes. First femur 3.1 mm, patella and tibia 3.9, metatarsus 3.4, tarsus 1.1. Second patella and tibia 3.2 mm, third 1.8, fourth 2.4.

Diagnosis. This male has an enlarged bubble-like subterminal apophysis (Figs. 91, 92) unlike that of any other species.

Metazygia rogenhoferi (Keyserling)
Figures 94–99; Map 2C

Zilla rogenhoferi Keyserling, 1878: 578, pl. 14, fig. 6, ♀. Keyserling, 1892: 296, pl. 15, fig. 219. Female holotype from Brazil in NMW, examined.

Zygiella rogenhoferi:—Roewer, 1942: 887. Bonnet, 1959: 5005.

Metazygia rogenhoferi:—Levi, 1974: 271.

Description. Female from Guaíba, Rio Grande do Sul. Carapace light orange. Chelicerae, labium, endites light orange. Sternum light orange. Legs light orange. Dorsum of abdomen white, with indistinct anterior dusky patches (Fig. 97). Venter with white pigment patches behind epigynum, on the sides and behind spinnerets (Fig. 98). Posterior median eyes 0.9 diameter of anterior medians, laterals 0.9 diameter. Anterior median eyes 1 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.2 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Total length 3.3 mm. Carapace 1.8 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 1.8 mm, patella and tibia 2.1, metatarsus 1.6, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.1, fourth 1.5.

Male from Guaíba, Rio Grande do Sul. Color as in female, but with pairs of dusky brackets on dorsum of abdomen and abdomen with less white pigment. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.9 diameter. Anterior median eyes their diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.4 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Second tibia thinner than first, with few macrosetae. Total length 4.1 mm. Carapace 1.9 mm long, 1.6 wide, 0.7 behind lateral eyes. First femur 2.2 mm, patella and tibia 3.1, metatarsus 2.4, tarsus 0.9. Second patella and tibia 2.1 mm, third 1.2, fourth 1.6.

Note. Males and females were collected together.

Variation. Total length of females 3.4 to 5.6 mm, males 3.4 to 4.2. The lateral bracts framing the epigynum on each side (Fig. 94) are transparent and variable in shape. Illustrations were made from specimens from Guaíba, Rio Grande do Sul, Brazil.

Diagnosis. Females differ from other female *Metazygia* by having transparent bracts on each side of the epigynum, having a short scape (Fig. 94), and by the flask-shaped median plate as seen in posterior view (Fig. 95). Males are separated from others by the long sword-shaped embolus (Fig. 99).

Natural History. Specimens were collected with bromeliads in São Paulo state.

Distribution. From Bahia State to Rio Grande do Sul, Brazil (Map 2C).

Specimens Examined. BRAZIL *Bahia:* Uruçuca, Fazenda Almada (MCN); Fazenda Jacarandá, Itamarajú (MCN). *Rio de Janeiro:* Rio de Janeiro, Pinheiro (MNRJ). *São Paulo:* Alto da Serra (MZSP); Barueri (MZSP); Itanhaém, Baixo Rio Branco (MZSP); Campo Limpo, EFSD (AMNH); Juquiá, Fazenda Poço Grande (MZSP); Jurubatuba (MZSP); Osasco (MZSP); Ribeirão Pires (AMNH); Ilha de São Sebastião (MZSP); São Bernando (MZSP). *Rio Grande do Sul:* Canela (MCN); Rio Grande, Estação Ecológica do Taim (MCN); Santa Vitória do Palmar, Estação. Ecológica do Taim (MCN); Guaíba, Granja Carola (MCN); Praia do Curumim (MCN); Torres (MCN); Triunfo (MCN); Viamão, Aguas Belas (MCN); Viamão, Lagoa do Casamento (MCN).

Metazygia barueri new species
Figures 100–103; Map 2F

Holotype. Female holotype and male paratype from Barueri, Est. São Paulo, Brazil, 8 Sept. 1965 (K. Lenko), in MZSP no. 4026. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace light orange, cephalic region orange. Chelicerae brown. Labium, endites orange. Sternum light orange. Coxae light orange, legs dusky orange. Dorsum of abdomen with folium outlined by dusky brackets and with a median longitudinal dusky line (Fig. 103). Venter light, without marks. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.4 diameter apart. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.5 mm. Carapace 2.4 mm long, 1.9 wide, 1.1 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.3, metatarsus 1.7, tarsus 0.9. Second patella and tibia 2.1 mm, third 1.3, fourth 1.9.

Diagnosis. Unlike the epigynum of other species, the area behind and on the side of the scape is wrinkled (Figs. 100–102).

Metazygia jamari new species
Figures 104–106; Map 2F

Holotype. Male holotype from Jamari, Rondônia, Brazil, 23 Jan. 1989 (Equipe Operação Jamari), in MCN no. 18550. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum orange. Legs orange. Dorsum of abdomen white with a pair of longitudinal dark bands (Fig. 106); venter gray. Carapace rebordered above first coxa. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.4 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Second tibia thinner than first. Total length 2.5 mm. Carapace 1.5 mm long, 1.1 wide, 0.5 behind lateral eyes. First femur 1.7 mm, patella and tibia 2.1, metatarsus 1.6, tarsus 0.7. Second patella and tibia 1.6 mm, third 0.8, fourth 1.2.

Note. I was not successful matching this male to a female.

Variation. Total length of males 2.4 to 2.8. The Porto Velho male differed slightly in the shape of the embolus. It is not known if the horse shoe-shaped structure above the embolus (Figs. 104, 105) breaks off when mating. Illustrations were made from the holotype.

Diagnosis. Metazygia jamari differs from other species by the U-shaped tip of the embolus and by the straight terminal apophysis (at 12 hr to 2 hr in Fig. 104, left in Fig. 105).

Distribution. Amazon region (Map 2F).

Specimens Examined. SURINAM *Marowijne:* Lawa River, Anapaike Village, 8–29 Nov. 1963, 1♂ (B. Malkin, AMNH). BRAZIL *Roraima:* Ilha de Maracá, Rio Uraricoera, 29 Mar. 1987, 1♂ (A. A. Lise, MCN 20060). *Rondônia:* Porto Velho, Rio Tapirape, Feb., Mar. 1963, 1♂ (P. Pinheiros, AMNH).

Metazygia crewi (Banks)
Plate 1; Figures 107–113; Map 2I

Singa crewi Banks, 1903: 342, pl. 15, fig. 8, ♀. Female holotype from Haiti, lost (not in AMNH, ANSP, CUC, MCZ, USNM). Roewer, 1942: 877.

Larinia coamensis Petrunkevitch, 1930: 335, figs. 221–224, ♀. Female holotype from Coamo Springs, Puerto Rico, in PMY, examined. Roewer, 1942: 771. Bonnet, 1957: 2348. First synonymized by Bryant 1945.

Aranea crewi:—Bryant, 1945: 364, figs. 1–3, ♂.

Araneus crewi:—Bonnet, 1955: 471.

Metazygia crewi:—Harrod, Levi, and Leibensperger, 1991: 245.

Description. Female from Puerto Plata, Dominican Republic. Carapace dusky orange, black between eyes, margin of thoracic region darker. Chelicerae dusky orange. Labium, endites orange. Sternum light yellow-brown, black on each side, black fusing posteriorly to form a V shape. Legs light orange, distally with some dark rings. Dorsum of abdomen with dusky median band, a white cardiac mark, a white band on each side and black on sides (Fig. 110). Venter black with a square white patch posterior to genital groove, black surrounding spinnerets, sides light (Fig. 111). Carapace narrow in front without thoracic depression. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 0.7 from laterals. Posterior median eyes 0.4 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 5.0 mm. Carapace 2.1 mm long, 1.6 wide, 0.7 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.5, metatarsus 1.9, tarsus 0.8. Second patella and tibia 1.9 mm, third 1.2, fourth 1.8.

Male specimen from Puerto Plata, Dominican Republic. Color as in female. Thoracic depression a longitudinal line. Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7, posterior 0.5. Anterior median eyes 1 diameter apart, slightly less from laterals. Posterior median eyes 0.4 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. First coxa with hook, fourth with a small macroseta. Total length 3.7 mm. Carapace 1.9 mm long, 1.5 wide, 0.6 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.9, metatarsus 2.2, tarsus 0.9. Second patella and tibia 2.0 mm, third 1.1, fourth 1.7.

Note. Males and females were collected together.

Variation. Total length of females 4.0 to 5.5 mm, males 3.3 to 3.7. Some females have three teeth on the anterior margin of the chelicerae, two on the posterior; others have four and three. The epigynum's transparent scape can be short (Fig. 107) or long and overhanging the anterior border of the epigynum; often it appears torn off with only a dark round scar. Illustrations were made from specimens collected in Puerto Plata, Dominican Republic; the web (Pl. 1) was photographed near Maricao, Puerto Rico.

Diagnosis. The female is separated from other species by having an epigynum that, when viewed posteriorly, has two long slits, separated by a narrow median plate (Fig. 108). The male is distinguished by having a palp with filamentous embolus and overhanging terminal apophysis (A) (Figs. 112, 113).

Natural History. Specimens were collected sweeping in forest on St. Johns, Virgin Islands, and in a coffee plantation at Jayuya, Puerto Rico. Many specimens came from an abandoned, dry, sunny road on a south-facing slope near Maricao, Puerto Rico, at 800 m elevation. The spiders had retreats in the heads of grass above a small transparent web (Pl. 1). These spiders could not be dislodged with a sweep net but had to be collected individually.

Distribution. Greater Antilles, Virgin Islands (Map 2I).

Specimens Examined. CUBA [no local.], 1♀ (R. V. Chamberlin, AMNH). HAITI Cap Haitien, Mar. 1934, 2♀ (Utowana Exped., MCZ); Dame Marie, 1941, 2♀, 1♂ (A. Audant, MCZ); Port-au-Prince, July 1941, 13♀, 2♂ (A. Audant, MCZ); 18–21 July 1955, 4♀, 2♂, 8 imm. (A. F. Archer, AMNH); 21, 22 Mar. 1969, 2♀; 30 Aug.–7 Sept. 1969, 2♀, 1♂ (L. Reynolds, MCZ). DOMINICAN REPUBLIC Balneario Saladilla, S Barahona, 8 Aug. 1958, 1♀ (A. F. Archer, AMNH); 5 km NW Las Matas de Farfan, 25 Aug. 1970, 1♀ (B. Patterson, MCZ); Loma de Los Piños, Colonia Ramfis, T. Valdez, 700–900 m, 7 Aug. 1958, 2♀ (A. F. Archer, E. Boynie Moya, AMNH); Puerto Plata, July–Aug. 1941, 23♀, 2♂ (D. Hurst, MCZ); La Gran Chorra, Altagracia, 11 Apr. 1992, 3♀ (F. Del Monte, MNSD). PUERTO RICO Jayuya, 1,000 m, 20–26 Mar. 1986, 2♀, imm. (H., L.

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Figures 107–113. *Metazygia crewi* (Banks). 107–111, female. 107–109, epigynum. 107, ventral. 108, posterior. 109, lateral. 110, dorsal. 111, abdomen, ventral. 112, 113, left male palpus. 111, mesal. 112, ventral.

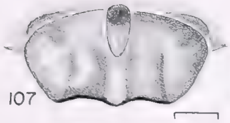
Figures 114–118. *M. vaurieorum* n. sp., female. 114–116, epigynum. 114, ventral. 115, posterior. 116, lateral. 117, dorsal. 118, abdomen, ventral.

Figures 119, 120. *M. carrizal* n. sp., male. 119, palpus. 120, dorsal.

Figures 121–124. *M. taman* n. sp., female. 121–123, epigynum. 121, ventral. 122, posterior. 123, lateral. 124, dorsal.

Figures 125–128. *M. paquisha* female. 125–127, epigynum. 125, ventral. 126, posterior. 127, lateral. 128, dorsal.

Figures 129–132. *M. nobas* n. sp., female. 129–131, epigynum. 129, ventral. 130, posterior. 131, lateral. 132, dorsal.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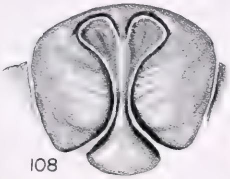
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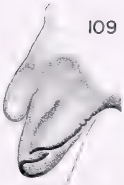
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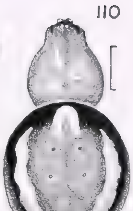
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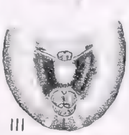
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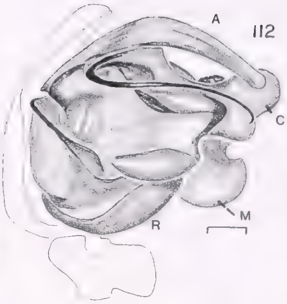
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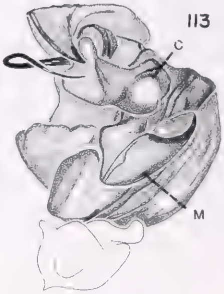
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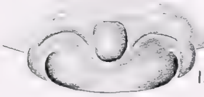
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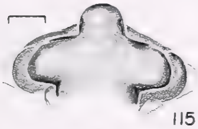
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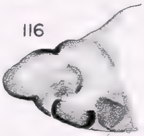
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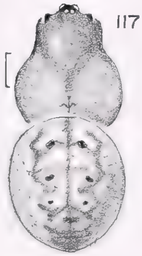
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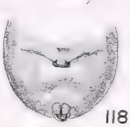
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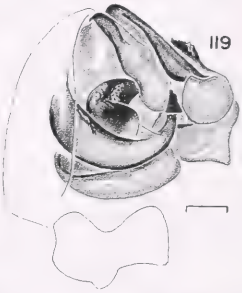
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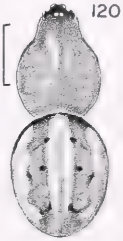
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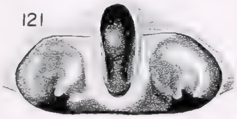
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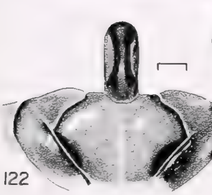
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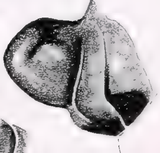
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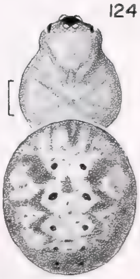
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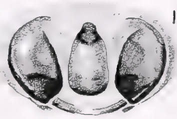
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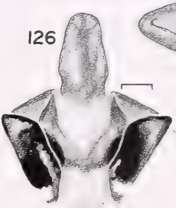
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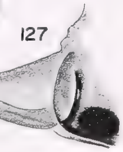
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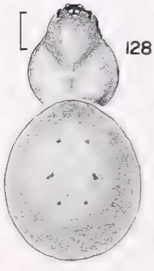
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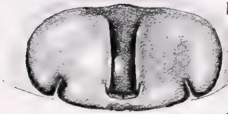
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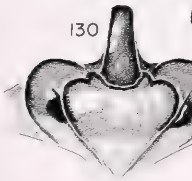
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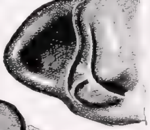
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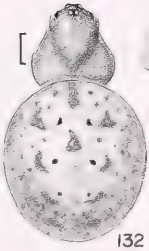
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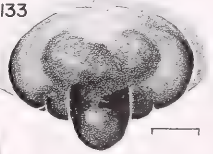
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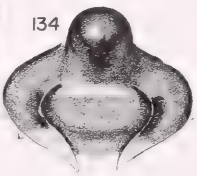
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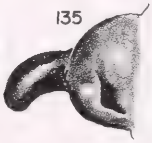
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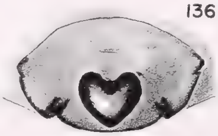
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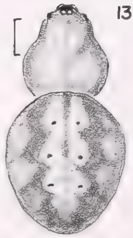
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Figures 133–137. *M. goeldii* n. sp., female. 133–136, epigynum. 133, ventral. 134, posterior. 135, lateral. 136, paratype, ventral. 137, dorsal.

Abbreviations. A, terminal apophysis; C, conductor; M, median apophysis; R, radix.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Levi, MCZ); Reserva Forestal, Maricao, Monte de Estado, 800 m, 4–6 Apr. 1989, 13♀, 16 imm. (H., L. Levi, MCZ). U.S. VIRGIN ISLANDS St. Johns, forest above Cinnamon Bay, 17 Mar. 1970, 1♀, 1♂ (H., L., F. Levi, MCZ).

Metazygia vaurieorum new species
Figures 114–118; Map 2I

Holotype. Female holotype and one paratype from Variedades, 14°01′N, 90°30′W, Suchitepéquez, 120–170 m, Guatemala 27–31 Aug. 1947, and two female paratypes, 1–4 July 1947 (C. and P. Vaurie), in AMNH. The species is named after the collectors.

Note. The location of the type locality is published in Vaurie and Vaurie (1949).

Description. Female holotype. Carapace orange, cephalic region darker. Chelicerae dark orange-brown. Labium, endites, sternum orange. Coxae legs orange. Dorsum of abdomen with gray folium pattern on white (Fig. 117). Venter with transverse white patch behind epigynum and semicircular white line in front of spinnerets (Fig. 118). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 6.0 mm. Carapace 3.5 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 3.4 mm, patella and tibia 4.1, metatarsus 3.2, tarsus 1.1. Second patella and tibia 3.6 mm, third 2.0, fourth 2.7.

Diagnosis. In ventral view the epigynum (Fig. 114) resembles that of *M. crewi* (Fig. 107), but the scape is a large knob rather than a flat plate (perhaps a piece has broken off). It differs in posterior view by having a wide median plate (Fig. 115).

Metazygia carrizal new species
Figures 119, 120; Map 2I

Holotype. Male holotype from Mataquescuintla, El Carrizal, Depto. Jalapa, Guatemala, beating foliage at river, 25 Apr. 1982 (S. Fend), in CAS. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace dusky orange to black. Chelicerae dusky orange. Labium black, endites orange. Sternum black. Coxae light orange, legs orange with dark rings. Dorsum of abdomen with median longitudinal light band and gray band to the side, whitish color to the sides of gray (Fig. 120). Venter dark with indistinct white pigment spots in center. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.3 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Second tibia thicker than first, with long macrosetae on both first and second tibiae. Total length 4.2 mm. Carapace 2.1 mm long, 1.5 wide, 0.8 behind lateral eyes. First femur 2.3 mm, patella and tibia 3.1, metatarsus 2.3, tarsus 0.9. Second patella and tibia 2.3 mm, third 1.2, fourth 1.8.

Note. This was collected near a *M. vaurieorum* female. However, it is considered to represent another species, as it has a different coloration: black sternum in male, light in female; white above cardiac area in male (Fig. 120), dark in female (Fig. 117).

Diagnosis. This species differs from all others by the terminal apophysis hanging "down" with its axis at an acute angle to the axis of the cymbium and by the shape of the sclerotized embolus lamella (at center of Fig. 119) and by the U-shaped embolus with a pointed cap (Fig. 119).

Metazygia taman new species
Figures 121–124; Map 2I

Holotype. Female holotype from near Taman, ca. 16 km SW of Tamazunchale on Highway 85, 21°11′N, 98°53′W, ca. 300 m, San Luis Potosí State, Mexico, 11 June 1983 (W. Maddison, R. S. Anderson), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, cephalic area dusky. Chelicerae, labium, endites orange-brown. Sternum dusky orange. Coxae, legs orange, distal articles darker. Dorsum of abdomen with paired dark gray marks on orange-gray (Fig. 124); venter uniformly dark gray. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 1.4 diameters from laterals. Posterior median eyes 0.3 diameter apart. Posterior median eyes oval, the long diameter from median posterior, to lateral and anterior. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 7.7 mm. Carapace 3.9 mm long, 3.0 wide, 1.6 behind lateral eyes. First femur 3.3 mm, patella and tibia 3.9, metatarsus 2.5, tarsus 1.1. Second patella and tibia 3.4 mm, third 2.1, fourth 3.1.

Diagnosis. This species has a thinner scape (Figs. 121–123) than does *M. paquisha* (Figs. 125–127), but the scape is rounded (Fig. 123) and the posterior median plate is wider (Fig. 122) than that of *M. paquisha* (Fig. 126).

Metazygia paquisha new species
Figures 125–128; Map 2H

Holotype. Female holotype from Alto Río Comaina, Puesto de Vigilancia 22, "Falso Paquisha," Cordillera del Condor, border with Ecuador, 05°02′S, 78°51′W, Depto. Amazonas, Peru, night collecting, 23 Oct. 1987 (D. Silva D.), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, darkest anterior. Chelicerae orange. Labium, endites, sternum dusky orange. Legs dusky orange, darkest distally. Abdomen gray without marks (Fig. 128). Carapace with a median line of setae. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 1.1 diameters from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 7.2 mm. Carapace 3.1 mm long, 2.3 wide, 1.3 behind lateral eyes. First femur 2.5 mm, patella and tibia 3.3, metatarsus 2.3, tarsus 0.9. Second patella and tibia 3.1 mm, third 2.1, fourth 2.5.

Illustration. Figures 125–128 were made from the holotype.

Diagnosis. The female differs from others by the wide massive scape (Figs. 125–127) and from *M. taman* (Figs. 121–124) by the more pointed scape and narrower posterior plate (Figs. 126, 127).

Distribution. Amazon Region (Map 2H).

Specimen Examined. VENEZUELA *Amazonas:* Cerro de la Neblina, base camp, 140 m, 0°50′N, 66°10′W, low foliage, 21–28 Feb. 1985, 1♀ (W. E. Steiner, USNM).

Metazygia nobas new species
Figures 129–132; Map 2H

Holotype. Female holotype from Baños, 1,600 m, Tungurahua Prov., Ecuador, July 1938, and paratype from Baños, 2,000 m, July–Aug. 1938 (W. C. Macintyre), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange-brown. Sternum dark orange. Legs orange. Dorsum of abdomen light with a faint folium and spots (Fig. 132); venter gray without marks. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1.7 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.5 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 8.6 mm. Carapace 4.0 mm long, 2.9 wide, 1.9 behind lateral eyes. First femur 3.0 mm, patella and tibia 3.6, metatarsus 2.3, tarsus 1.1. Second patella and tibia 3.2 mm, third 2.2, fourth 2.9.

Diagnosis. The epigynum (Figs. 129–131) differs from that of the Mexican *M. taman* (Figs. 121–123) and the Colombian *M. chenevo* (Figs. 177–179) by having the median anterior edge of the base sclerotized (at 12 hr in Fig. 129) and the posterior median plate heart-shaped (Fig. 130). *Metazygia nobas* differs from *M. paquisha* (Fig. 126) in the wider posterior median plate (Fig. 130). The posterior margin of the epigynum base in ventral view has a notch on each side (at 7 hr and 5 hr in Fig. 129) resembling that of *M. voluptifica* (Fig. 280).

Metazygia goeldii new species
Figures 133–137; Map 2K

Holotype. Female holotype from Goeldi Museum, Belém, Est. Pará, Brazil, 10 Feb. 1959 (A. M. Nadler), in AMNH. The species is named after the Brazilian naturalist E. Göldi.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites dark orange. Sternum orange. Coxae lightest orange, legs dusky orange. Dorsum of abdomen light with gray folium (Fig. 137); venter light dusky. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 1.2 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 6.0 mm. Carapace 2.8 mm long, 2.3 wide, 1.2 behind lateral eyes. First femur 2.4 mm, patella and tibia 2.9, metatarsus 2.0, tarsus 0.9. Second patella and tibia 2.5 mm, third 1.7, fourth 2.3.

Variation. Total length of females 4.7 to 6.0 mm. The shape of the scape in the two specimens differs (Figs. 133, 136). Illustrations (Figs. 133–135, 137) were made from the female holotype.

Diagnosis. The abdomen is oval, widest in anterior half (Fig. 137). *Metazygia goeldii* differs from others by the knob-shaped scape (Figs. 133–135), which appears curved in lateral view (Fig. 135).

Specimen Examined. BRAZIL *Pará:* Belém, Inst. Agron., 11 Feb. 1959, 1♀ (A. Nadler, AMNH).

Metazygia adisi new species
Figures 138–141; Map 2H

Holotype. Female holotype from Lago do José, Manaus, Amazonas State, Brazil, 9 Aug. 1987 (J. Adis et al.), in MCN no. 20058. The species is named after the collector.

Description. The female holotype has lost all white pigment including the silver tapetum; it apparently was collected in a preservative other than alcohol (Levi, 1989). The specimen is all orange, except for a black band around anterior of abdomen which is in the middle (Fig. 141). The eye region is black. Posterior median eyes same diameter as anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Abdomen slightly flattened anteriorly (Fig. 141). Total length 3.7 mm. Carapace 1.8 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.5, metatarsus 1.8, tarsus 0.6. Second patella and tibia 2.1 mm, third 1.2, fourth 1.8.

Diagnosis. Unlike other species, *Metazygia adisi* has framed bulges on each side of the scape of the epigynum (Figs. 138, 139).

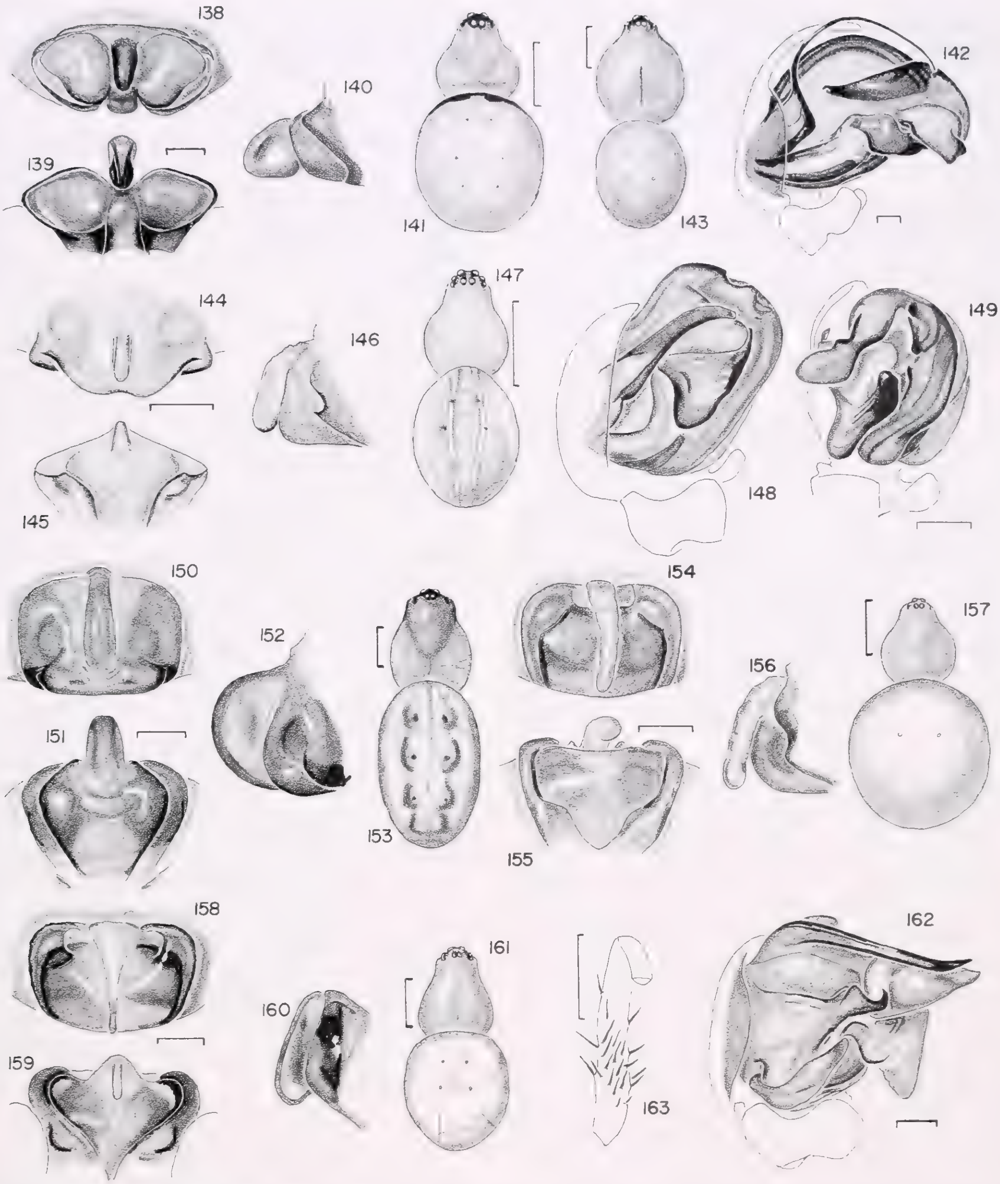
Metazygia arnoi new species
Figures 142, 143; Map 2H

Holotype. Male holotype from Morro dos Seis Lagos, Parque Nacional do Pico da Neblina, Est. Amazonas, Brazil, 3 Oct. 1990 (A. A. Lise), in MCP. The species is named after the collector.

Description. Male holotype. Carapace orange. Chelicerae orange. Labium, endites, orange. Sternum orange, slightly dusky. Coxae; legs orange. Dorsum of abdomen light gray with faint dusky marks, pairs of spots and outline of folium (Fig. 143); venter light gray. Carapace with median longitudinal line. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 0.4 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.1 mm. Carapace 2.6 mm long, 2.1 wide, behind lateral eyes 0.8 wide. First femur 2.4 mm, patella and tibia 2.7, metatarsus 2.0, tarsus 0.8. Second patella and tibia 2.3 mm, third 1.4, fourth 1.9.

Note. This might be the male of *M. paquisha*.

Diagnosis. The palpus (Fig. 142) lacks a terminal apophysis and differs from all others by the loop of the thread-shaped embolus (at 12 hr in Fig. 142).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Figures 138–141. *Metazygia adisi* n. sp., female. 138–140, epigynum. 138, ventral. 139, posterior. 140, lateral. 141, dorsal.

Figures 142, 143. *M. arnoi* n. sp., male. 142, left male palpus. 143, dorsal.

Figures 144–149. *M. curari* n. sp. 144–147, female. 144–146, epigynum. 144, ventral. 145, posterior. 146, lateral. 147, dorsal. 148, 149, male palpus. 148, mesal. 149, ventral.

Figures 150–153. *M. bolivia* n. sp., female. 150–152, epigynum. 150, ventral. 152, posterior. 152, lateral. 153, dorsal.

Figures 154–163. *M. yucumo* n. sp., 154–161, female. 154–156, 158–160, epigynum. 154, 158, ventral. 155, 159, posterior. 156, 160, lateral. 157, 161, dorsal. 154–157, (Colombia). 158–161, (Bolivia). 162, 163, male. 162, palpus. 163, left femur, subventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Metazygia curari new species
Figures 144–149; Map 2H

Holotype. Female holotype from Ilha de Curari, Manaus, Est. Amazonas, Brazil, 3 Aug. 1987 (J. Adis et al.), in MCN no. 20055. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace yellowish white, little black between eyes. Chelicerae, labium, endites yellowish white. Sternum, legs yellowish white. Dorsum of abdomen with two longitudinal white lines on dusky white (Fig. 147); venter yellowish white. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 1.2 diameters apart, 0.4 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 2.7 mm. Carapace 1.25 mm long, 0.97 wide, 0.49 behind lateral eyes. First femur 1.38 mm, patella and tibia 1.61, metatarsus 1.11, tarsus 0.49. Second patella and tibia 1.32 mm, third 0.82, fourth 1.28.

Male. Color as in female but distal articles of legs dusky. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.4 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.1 diameter apart, 1.2 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Endite with pointed tooth. Second tibia thicker than first, proximally swollen with macrosetae. Total length 2.5 mm. Carapace 1.32 mm long, 1.05 wide, 0.66 behind lateral eyes. First femur 1.30 mm, patella and tibia 1.61, metatarsus 1.13, tarsus 0.59. Second patella and tibia 1.32 mm, third 0.84, fourth 1.09.

Note. Males and females were matched because both have similar median white lines on the abdomen and little black pigment between eyes. Their collecting localities are within 10 km of each other. A recently collected female had a green abdomen.

Diagnosis. The pair of longitudinal white lines on the abdomen (Fig. 147) is a distinctive character. In ventral view of the epigynum, the median plate overlaps the lateral plates along their posterior margins (at 8 hr, and at 4 hr in Fig. 144). The palpus lacks a terminal apophysis and the embolus has a distinctive shape (Fig. 148).

Specimens Examined. BRAZIL *Amazonas:* Manaus, Canal Januari, mixed water forest, 16, 17 June 1987, 1♂ (H. Höfer, INPA); Ilha de Marchantaria, Rio Solimões, 3°15′S, 59°58′W, 2 Sept. 1992, 1♀ (J. Adis et al., INPA).

Metazygia bolivia new species
Figures 150–153; Map 2F

Holotype. Female holotype from Est. Biológico Beni, Zone 3, ca. 14°47′S, 66°15′W, ca. 225 m, Depto. Beni, Bolivia, 8–14 Nov. 1989 (J. Coddington, S. Larcher, C. Griswold, D. Silva D., E. Pañaranda), in IELP. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, sides of thoracic region lightest. Chelicerae orange-brown. Labium, endites dark orange. Sternum orange. Coxae light orange, legs dusky orange. Dorsum of abdomen with white pigment spots and pairs of gray brackets (Fig. 153); venter light gray. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.4 diameter apart. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 6.7 mm. Carapace 3.0 mm long, 2.0 wide, 1.5 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.5, metatarsus 1.8, tarsus 0.8. Second patella and tibia 2.3 mm, third 1.5, fourth 2.0.

Diagnosis. The elongate abdomen (Fig. 153) suggests that this species may belong to another genus, as yet unnamed, whose species have a cylindrical abdomen. However, the epigynum is of the characteristic shape found in *Metazygia,* although the flat scape is larger than in other species (Figs. 150–152).

Metazygia yucumo new species
Figures 154–163; Map 2K

Holotype. Female holotype, female and male paratypes from 26.9 km SW Yucumo, 500 m, ca. 15°23′S, 66°59′W, Depto. Beni, Bolivia, 15–19 Nov. 1989 (J.

Coddington, C. Griswold, D. Silva D., S. Larcher, E. Pañaranda), in USNM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace light orange-yellow. Chelicerae, labium, endites orange-yellow. Sternum, coxae orange-yellow. Legs orange-yellow, except distal half of first femora with brown ring, underside black, and first two tibiae and distal articles brown, underside darker. Dorsum of abdomen white without pattern (Figs. 157, 161); venter light gray. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes their diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.2 mm. Carapace 2.0 mm long, 1.4 wide, 0.8 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.7. Second patella and tibia 2.2 mm, third 1.1, fourth 1.8.

Male. Color as in female. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes their diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. First femur with many macrosetae (Fig. 163). Total length 4.2 mm. Carapace 1.9 mm long, 1.3 wide, 0.6 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.9, metatarsus 2.3, tarsus 0.9. Second patella and tibia 2.3 mm, third 1.1, fourth 1.7.

Note. Males and females were collected together.

Variation. Total length of females 3.7 to 4.5 mm. The openings of the epigynum may be indistinct and hard to see (Fig. 154); some have a lip laterally (Fig. 158). Illustrations were made from the female holotype (Figs. 158–161) and a female from Mitú, Colombia (Figs. 154–157), and the male paratype.

Diagnosis. The female is separated from others by the epigynum, which has an indistinct pair of anterior median openings on each side of a thin scape (at 11 hr and at 1 hr in Figs. 154, 158). The male has a brush of ventral setae on the underside of the femur (Fig. 163), and the tip of the embolus is hook-shaped (Fig. 162).

Distribution. Upper Amazon region (Map 2K).

Specimens Examined. COLOMBIA *Vaupés:* Mitú, 200 m, Feb. 1975, 1♀ (P. A. Schneble, MCZ). PERU *Huánuco:* Divisoria, 1,700 m, 23 Sept. to 3 Oct. 1946, 1♀ (F. Woytkowski, AMNH). *Madre de Dios:* El Limonal, Alto Río Madre de Dios, 21 July 1988, night collecting, 1♀ (P. Lozada, MUSM).

Metazygia ipanga new species
Figures 164–167; Map 2K

Holotype. Female holotype from Museum Park, Ipiranga, São Paulo, Est. São Paulo, Brazil, 6 Dec. 1960 (J. Luiz), in MZSP no. 7642. The specific name is an arbitrary combination of letters.

Note. Ipiranga is the district of the city of São Paulo in which the MZSP is located.

Description. Female holotype. Cephalothorax very light orange, only eyes with black pigment. Dorsum of abdomen whitish with faint black band around anterior (Fig. 167). Venter whitish without pigment. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.7 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 4.5 mm. Carapace 1.9 mm long, 1.4 wide, 0.8 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.5, metatarsus 2.0, tarsus 0.6. Second patella and tibia 2.0 mm, third 1.2, fourth 1.8.

Variation. The holotype lacks white pigment; it appears washed out by the preserving fluid (Levi, 1989). The specimen from the Chaco Prov., Argentina, had both sides of the abdomen white and white pigment spots anterior to the black band. The Bolivian specimen had black pigment between the eyes and a square white pigment area on the venter of the abdomen. The holotype was illustrated.

Diagnosis. The abdomen is spherical (Fig. 167). This species differs from *M.*

uraricoera by the shape of the posterior median plate of the epigynum (Fig. 165).

Distribution. São Paulo State, northern Argentina to Bolivia (Map 2K).

Specimens Examined. BOLIVIA *Beni:* Est. Biol. Beni, 14°47'S, 66°15'W, ca. 225 m, 8–14 Nov. 1989, 1♀ (J. Coddington et al., USNM). ARGENTINA *Chaco:* Selvas del Río Oro, 27 Jan. 1965, 1♀ (M. E. Galiano, MEG).

Metazygia uraricoera new species
Figures 168–171; Map 2K

Holotype. Female holotype from Ilha de Maracá, Rio Uraricoera, Est. Roraima, Brazil, 20 Mar. 1987 (A. A. Lise), in MCN no. 20064. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, eye region black. Chelicerae dark orange. Labium, endites dark orange. Sternum orange. Legs orange. First femur with a distal black spot on underside, distal end of first tibia dark. Dorsum of abdomen white with an anterior pair of black spots (Fig. 171). Venter with a white longitudinal band, starting at the side of booklung covers. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. All patellae with a posterior, blunt tubercle. Total length 3.1 mm. Carapace 1.4 mm long, 1.1 wide, 0.5 behind lateral eyes. First femur 1.4 mm, patella and tibia 1.6, metatarsus 1.2, tarsus 0.5. Second patella and tibia 1.3 mm, third 0.8, fourth 1.1.

Variation. Total length of females 3.1 to 4.4 mm. The specimen from Surinam had the epigynum slightly shorter in posterior view and the abdomen more elongate. Illustrations were made from the holotype.

Diagnosis. The epigynum of this species, unlike that of others, has a sclerotized notch anteriorly on each side (at 10 hr and at 2 hr in Fig. 168) and a long narrow posterior median plate (Fig. 169).

Natural History. The specimen collected in Guyana came from forest savanna.

Distribution. Guianas to northern Brazil (Map 2K).

Specimens Examined. GUYANA Canje River, Ikuruwa, 5°50'N, 57°50'W, Aug.–Sept. 1961, 1♀ (G. Bentley, AMNH). SURINAM *Marowijne:* Lawn River, Anapaike Village, Nov. 1963, 1♀ (B. Malkin, AMNH). BRAZIL *Amazonas:* Morro dos Seis Lagos, Parque Nacional do Pico da Neblina, 5 Oct. 1990, 1♀ (A. A. Lise, MCP).

Metazygia serian new species
Figures 172–176; Map 2I

Holotype. Female holotype from La Selva, 4 km SE of Puerto Viejo, Heredia Prov., Costa Rica, 7 Aug. 1980, probably from wasp nest (R. Coville), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, cephalic region brown, eye region black. Chelicerae dark brown to black. Labium, endites brown. Sternum orange. Coxae, legs orange. Dorsum of abdomen with dense white pigment spots and transverse black band around anterior (Fig. 175). Venter white with a large white square between epigynum and spinnerets (Fig. 176). Posterior median eyes 0.9 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.2 diameters from laterals. Height of

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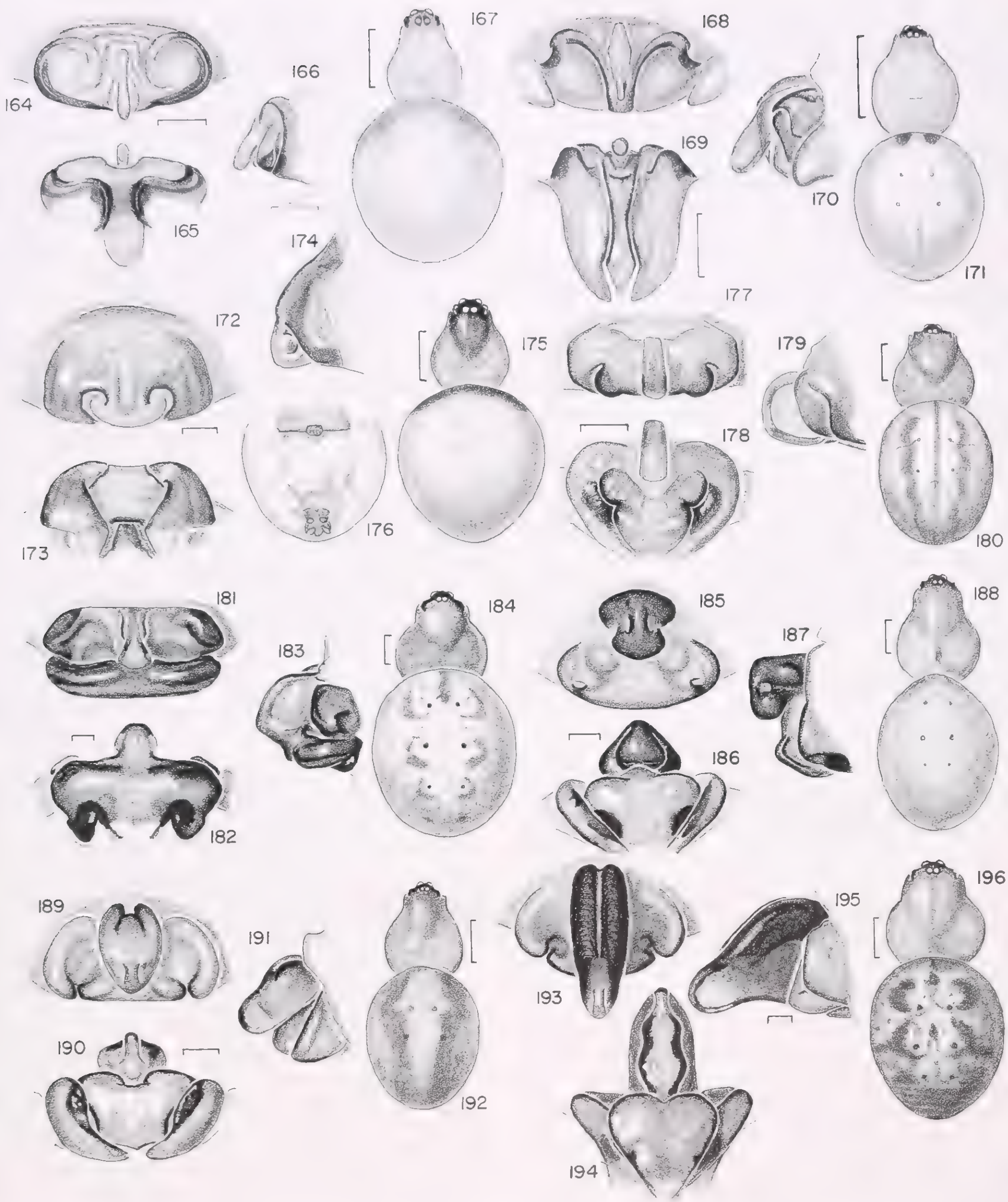
Figures 164–167. *M. ipanga* n. sp., female. 164–166, epigynum. 164, ventral. 165, posterior. 166, lateral. 167, dorsal.

Figures 168–171. *M. uraricoera* n. sp., female. 168–170, epigynum. 168, ventral. 169, posterior. 170, lateral. 171, dorsal.

Figures 172–176. *M. serian* n. sp., female. 172–174, epigynum. 172, ventral. 173, posterior. 174, lateral. 175, dorsal. 176, abdomen, ventral.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Figures 177–180. *M. chenevo* n. sp., female. 177–179, epigynum. 177, ventral. 178, posterior. 179, lateral. 180, dorsal.

Figures 181–184. *M. lazepa* n. sp., female. 181–183, epigynum. 181, ventral. 182, posterior. 183, lateral. 184, dorsal.

Figures 185–188. *M. atalaya* n. sp., female. 185–187, epigynum. 185, ventral. 186, posterior. 187, lateral. 188, dorsal.

Figures 189–192. *M. corima* n. sp., female. 189–191, epigynum. 189, ventral. 190, posterior. 191, lateral. 192, dorsal.

Figures 193–196. *M. uratron* n. sp., female. 193–195, epigynum. 193, ventral. 194, posterior. 195, lateral. 196, dorsal.

Scale lines. 1.0 mm, genitalia 0.1 mm.

clypeus equals 0.7 diameter of anterior median eye. Total length 5.0 mm. Carapace 1.8 mm long, 1.5 wide, 0.9 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.6, metatarsus 1.8, tarsus 0.6. Second patella and tibia 2.2 mm, third 1.2, fourth 1.9.

Variation. Total length of females 4.8 to 5.0 mm. Living specimens are green (Eberhard, in letter). Illustrations were made from the holotype.

Diagnosis. The abdomen is subspherical, widest in anterior half (Fig. 175). This species resembles the tetragnathid genus *Chrysometa* in general appearance and epigynum (but not the coloration). In ventral view, the epigynum has openings close to the posterior margin (Fig. 172), unlike any other *Metazygia* species.

Paratype. COSTA RICA *Heredia:* La Selva, Jan. 1978, 1♀ (W. Eberhard no. 1279, MCZ).

Metazygia chenevo new species
Figures 177–180; Map 3A

Holotype. Female holotype from Finca Chenevo, 175 m elev., 20 km S El Porvenir, 20 km N Río Muco, Depto. Meta, Colombia, 1978 (W. Eberhard, no. 1386), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, cephalic region darkest. Chelicerae orange-brown. Labium, endites orange. Sternum orange. Coxae lighter orange, legs dusky orange. Dorsum of abdomen with three longitudinal dusky bands on white (Fig. 180), sides and venter gray. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.2 diameter apart, 3 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 6.0 mm. Carapace 2.9 mm long, 2.2 wide, 1.3 behind lateral eyes. First femur 2.7 mm, patella and tibia 3.1, metatarsus 2.1, tarsus 0.9. Second patella and tibia 2.7 mm, third 1.7, fourth 2.2.

Diagnosis. Unlike the Ecuadorian *M. nobas* (Fig. 130), the posterior median plate of the epigynum has a lateral constriction in posterior view (Fig. 178).

Distribution. Amazon drainage, Colombia to Guyana (Map 3A).

Specimen Examined. GUYANA Rupununi Savanna, swamp, Sept.–Oct. 1989, 1♀ (S. Djojosudharmo, F. Mees, CD).

Metazygia lazepa new species
Figures 181–184; Map 3A

Holotype. Female holotype from Hacienda Mozambique, 15 km SW Puerto Lopez, 200 m, Depto. Meta, Colombia, Aug. 1978 (W. Eberhard, no. 1812), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, cephalic region orange-brown. Chelicerae brown. Labium, endites orange brown. Sternum, coxae orange; legs dark orange. Dorsum of abdomen light gray with pairs of gray brackets (Fig. 184); venter gray without markings. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 1 diameter from laterals. Posterior median eyes 0.2 diameter apart, 2.5 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 8.8 mm. Carapace 3.8 mm long, 3.1 wide, 2.0 behind lateral eyes. First femur 3.4 mm, patella and tibia 3.9, metatarsus 2.9, tarsus 1.2. Second patella and tibia 3.4 mm, third 2.1, fourth 3.1.

Diagnosis. Unlike other *Metazygia,* the posterior plate of the epigynum is wide and completely covers the lateral plates (Figs. 181, 182). The holotype was illustrated.

Distribution. Colombia, Venezuela (Map 3A).

Specimen Examined. VENEZUELA *Carabobo:* San Esteban, 26 Jan. 1940, 1♀ (P. Andruze, AMNH).

Metazygia atalaya new species
Figures 185–188; Map 3A

Holotype. Female holotype from Atalaya, Río Carbón, night collecting, Depto. Cuzco, Peru, 23 Sept.

1987 (D. Silva D.), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites dark orange. Sternum orange. Legs dusky orange. Abdomen gray without any marks (Fig. 188). Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7 diameter, posterior 0.6. Anterior median eyes 0.7 diameter apart, 1.1 diameters from laterals. Posterior median eyes 0.2 diameter apart. Posterior median eyes slightly oval. Height of clypeus equals 0.3 diameter of anterior median eye. The abdomen is slightly pointed anteriorly (Fig. 188). Total length 7.5 mm. Carapace 3.2 mm long, 2.4 wide, 1.4 behind lateral eyes. First femur 2.9 mm, patella and tibia 3.4, metatarsus 2.5, tarsus 1.2. Second patella and tibia 3.1 mm, third 1.9, fourth 2.7.

Diagnosis. The abdomen is slightly pointed anteriorly (Fig. 188). The epigynum of this species differs from that of others by the unusual shape of the scape (Figs. 185–187).

Metazygia corima new species
Figures 189–192; Map 3B

Holotype. Female holotype from Carimagua, 100 m, Depto. Meta, Colombia, grass, brush along fence, Oct. 1973 (W. Eberhard), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, cephalic region brown. Chelicerae brown. Labium, endites orange. Sternum dark orange. Coxae, legs orange. Dorsum of abdomen with a median longitudinal light band that is bordered by darker ones (Fig. 192). Sides, venter gray. Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7 diameter, posterior 0.6. Anterior median eyes 0.6 diameter apart, 1 diameter from laterals. Posterior median eyes 0.4 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 5.5 mm. Carapace 2.7 mm long, 1.7 wide, 1.1 wide behind lateral eyes. First femur 2.3 mm, patella and tibia 2.7, metatarsus 1.9, tarsus 0.8. Second patella and tibia 2.4 mm, third 1.5, fourth 2.1.

Diagnosis. The epigynum and scape resembles that of *Araneus tiganus* (Chamberlin) (Levi, 1991a, figs. 9–11); the scape is oval in ventral view (Fig. 189).

Metazygia uratron new species
Figures 193–196; Map 3A

Holotype. Female holotype from Fazenda Santo Antonio, Uruçuca, Bahia, Brazil, 24 Oct. 1978 (J. S. Santos), in MCN no. 1097. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange. Chelicerae dark orange. Labium, endites orange. Sternum light orange, with irregular dusky spots. Coxae light orange, legs orange. Dorsum of abdomen dusky with darker gray folium outline (Fig. 196). Venter gray without marks. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 7.0 mm. Carapace 3.4 mm long, 2.5 wide, 1.5 behind lateral eyes. First femur 3.1 mm, patella and tibia 3.3, metatarsus 2.3, tarsus 1.1. Second patella and tibia 2.7 mm, third 1.9, fourth 2.7.

Diagnosis. This species differs from other *Metazygia* by the shape of the large scape (Figs. 193–195).

Metazygia saturnino new species
Figures 197–202; Map 3A

Holotype. Male holotype and immature male from Barragem Saturnino de Brito, Santa Maria, Rio Grande do Sul, Brazil, 7 July 1982 (M. Rosenau), in MCN no. 10596. The specific name is a noun in apposition after the type locality.

Description. Female from Rio Grande, Rio Grande do Sul. Carapace with cephalic region brown, thoracic region light orange. Chelicerae brown. Labium, endites, brown. Sternum dusky orange. Coxae light orange; legs orange to brown, first two legs and distal articles darkest. Dorsum of abdomen with gray pattern on light gray (Fig. 200); venter light gray. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 5.3 mm. Carapace 2.5 mm long, 2.1 wide, 1.2 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.5, metatarsus 1.7, tarsus 0.8. Second patella and tibia 2.3 mm, third 1.3, fourth 1.8.

Male holotype. Color as in female but sternum and coxae are both orange. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.2 diameter apart, 2 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. First coxa with minute hook. Second tibia as thick as first. Total length 4.5 mm. Carapace 2.3 mm long, 1.9 wide, 0.8 wide behind lateral eyes. First femur 2.7 mm, patella and tibia 3.3, metatarsus 2.5, tarsus 1.1. Second patella and tibia 2.8 mm, third 1.4, fourth 1.9.

Note. Males and females were matched because of similar size and dark cephalic region of carapace.

Variation. The epigynum of the female is probably broken off (Figs. 197–199).

Diagnosis. The base of the epigynum appears broken. The epigynum has a long, wide posterior median plate (Fig. 198). The male differs from that of *M. crabroniphila* (Fig. 207) by the shape of the conductor and the much larger radix (Fig. 201).

Specimen Examined. BRAZIL *Rio Grande do Sul:* Rio Grande, Est. Ecológica do Taim, 15 Oct. 1985, 1♀ (H. Buckup, MCN 13559).

Metazygia crabroniphila Strand
Figures 203–207; Map 3B

Aranea (*Metazygia*) *crabroniphila* Strand, 1915: 117. Female and male syntypes from Joinville, Est. Santa Catarina, Brazil, in SMF, examined.

Metazygia crabroniphila:—Roewer, 1942: 867. Bonnet, 1957: 2819.

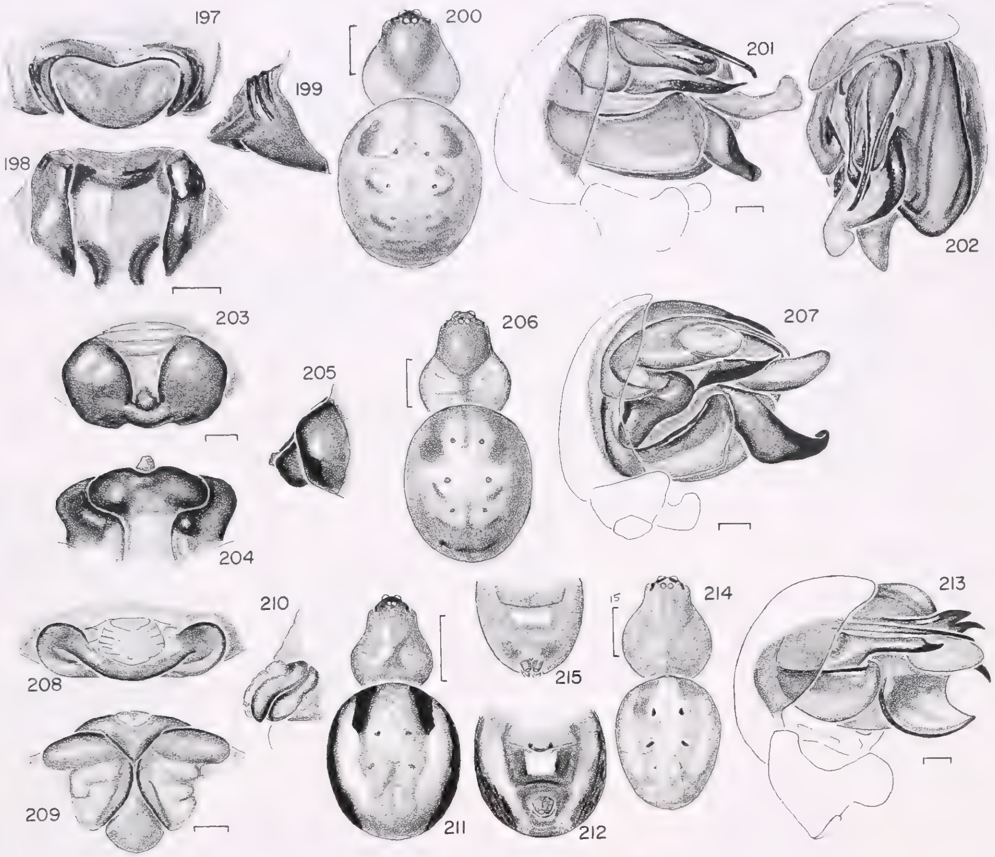
Description. Female from Jurubatuba, Est. São Paulo. Carapace light orange, cephalic region orange. Chelicerae brown. Labium, endites dark orange. Sternum orange. Coxae light orange; legs orange, distal articles darker. Dorsum of abdomen with a pair of anterior dusky patches and pairs of diagonal marks (Fig. 206); venter light, without marks. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 5.5 mm. Carapace 2.4 mm long, 1.8 wide, 1.1 wide behind lateral eyes. First femur 2.1 mm, patella and tibia 2.6, metatarsus 1.6, tarsus 0.5. Second patella and tibia 2.3 mm, third 1.3, fourth 1.8.

Male from Pinhal, Santa Catarina, Brazil. Color as in female. Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.8 diameter, posterior laterals 0.6. Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. First coxa without hook. Total length 4.0 mm. Carapace 2.5 mm long, 1.8 wide, 0.9 wide behind lateral eyes. First femur 2.4 mm, patella and tibia 3.1, metatarsus 2.2, tarsus 0.9. Second patella and tibia 2.7 mm, third 1.3, fourth 1.8.

Variation. Total length of females 4.5 to 8.0 mm, males 4.0 to 4.3. It is uncertain whether the scape of the epigynum is torn off in all examined or is a minute bulge (Fig. 203). Illustrations were made from a female and male from Pinhal. The dorsal view is of a female from Jurubatuba.

Diagnosis. The female can be separated from others by the two oval sclerotized plates of the epigynum (Fig. 203). The male can be distinguished from *M. saturnino* by having a straight conductor (at 3 hr in Fig. 207) and a longer median apophysis (at 4 hr and at 5 hr in Fig. 207).

Natural History. Most examined spec-



Figures 197–202. *Metazygia saturnino* n. sp. 197–200, female. 197–199, epigynum. 197, ventral. 198, posterior. 199, lateral. 200, dorsal. 201, 202, left male palpus. 201, mesal. 202, apical.

Figures 203–207. *M. crabroniphila* Strand. 203–206, female. 203–205, epigynum. 203, ventral. 204, posterior. 205, lateral. 206, dorsal. 207, male palpus.

Figures 208–212. *M. matanzas* n. sp., female. 208–210, epigynum. 208, ventral. 209, posterior. 210, lateral. 211, dorsal. 212, abdomen, ventral.

Figures 213–215. *M. corumba* n. sp., male. 213, palpus. 214, dorsal. 215, abdomen, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

imens are in poor condition and may all have come from wasp nests.

Specimens Examined. BRAZIL *São Paulo:* Jurubatuba, 6 July 1941, 1♀ (F. Lane, MZSP 9630); Jardim Botânico, Agua Funda, 7 July 1962, 1♀, 1♂ (A. F. Archer, AMNH). *Paraná:* Curitiba, 2 Feb. 1988, 3♂ (D. H. Habeck, FSCA). *Santa Catarina:* Pinhal, Dec. 1947, 7♀, 1♂; Jan. 1948, 1♀; Dec. 1948, 2♀, 1♂; Jan. 1949, 3♀ (A. Maller, AMNH).

Metazygia matanzas new species
Figures 208–212; Map 2J

Holotype. Female holotype from Pan de Palenque, Matanzas, Cuba, 11 Aug. 1955 (A. F. Archer), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace dusky orange, darkest in eye region.

Chelicerae, labium, endites dusky orange. Sternum orange with sides black. Coxae orange, legs dusky orange. Dorsum of abdomen with black bands on sides, bordered by white bands, and an indistinct dusky folium containing anterior black marks (Fig. 211). Venter with white patch on black (Fig. 212). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.7 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 3.9 mm. Carapace 1.6 mm long, 1.2 wide, 0.7 wide behind lateral eyes. First femur 1.4 mm, patella and tibia 1.8, metatarsus 1.1, tarsus 0.7. Second patella and tibia 1.5 mm, third 0.9, fourth 1.2.

Diagnosis. This species may belong to *Araneus* because it has an annulate, flat, round scape (Fig. 208). It is placed here because of the shape of the abdomen and the position of the posterior median eyes (Fig. 211).

Metazygia corumba new species
Figures 213–215; Map 3B

Holotype. Male holotype and male paratype (with one female of *M. voluptifica*) from Corumbá, Mato Grosso do Sul, Brazil, 28–29 May 1960 (B. Malkin), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Cephalothorax orange. Dorsum of abdomen white with sides dusky. Venter with white patch behind genital groove (Fig. 215). Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.8 diameter, posterior laterals 0.7. Anterior median eyes 0.6 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.7 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Endite without tooth. First coxa with small hook. Total length 5.2 mm. Carapace 2.5 mm long, 2.0 wide, 1.0 wide behind lateral eyes. First femur 2.6 mm, patella and tibia 3.2, metatarsus 2.4, tarsus 0.9. Second patella and tibia 2.7 mm, third 1.5, fourth 2.0.

Note. The two males from Corumbá were collected with a female of *M. mundula*.

Variation. Total length of males 3.7 to 5.2 mm. Illustrations were made from the holotype.

Diagnosis. This species differs from *M. crabroniphila* by having the two edges of the embolus straight and parallel (Fig. 213).

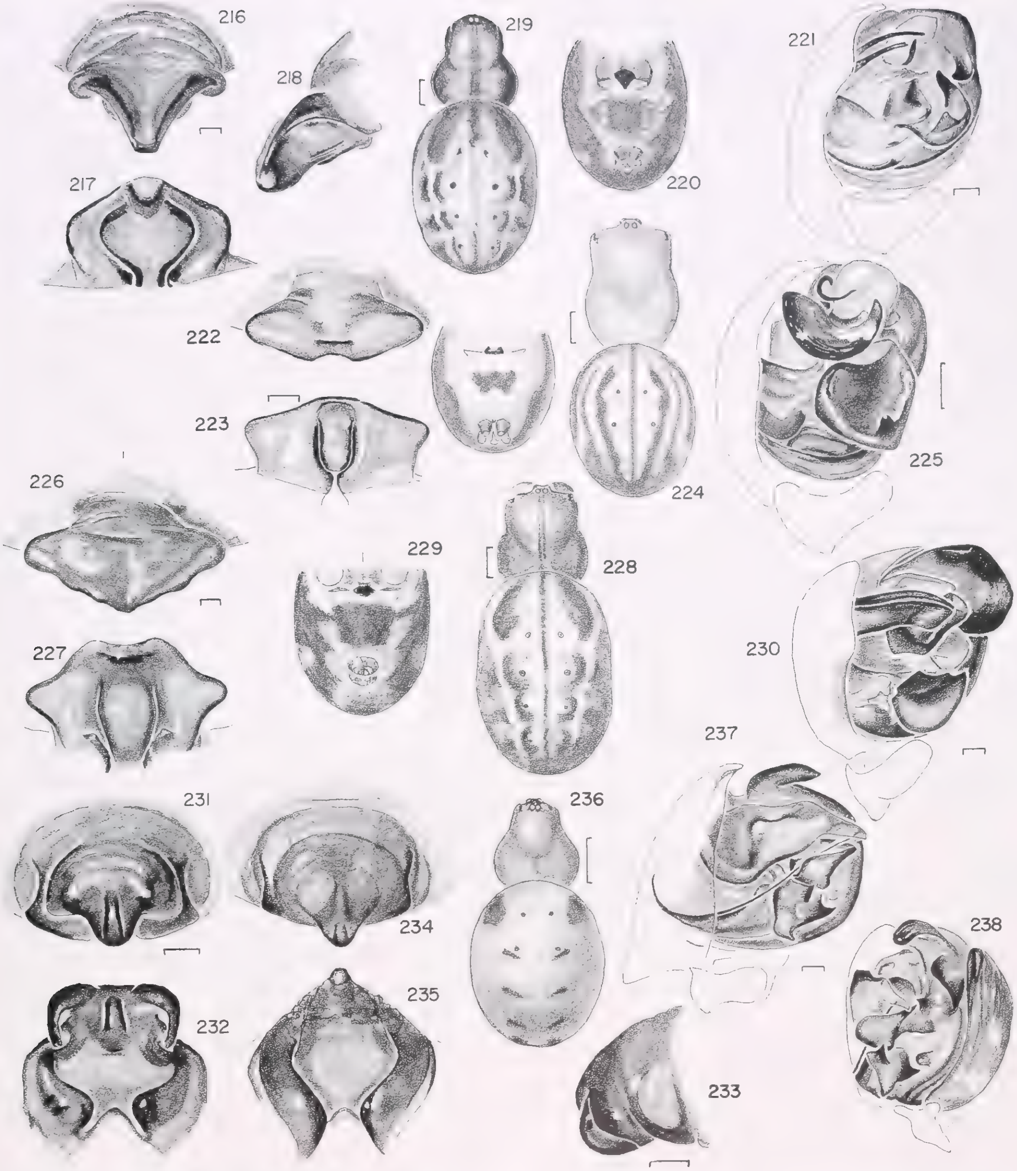
Specimen Examined. BOLIVIA *Santa Cruz:* Mataral, 14 Dec. 1984, 1♂ (L. Peña, AMNH).

Metazygia sendero new species
Figures 216–221; Map 3B

Holotype. Female holotype from Sendero Campamento, Laguna Grande, PUCE Field Station, Reserva Faunistica Cuyabeno, 00°00'N, 76°10–11'W, 31 July to 5 Aug. 1988, Sucumbíos Prov., Ecuador, 31 July to 5 Aug. 1988 (W. Maddison), in MECN. The specific name is a noun in apposition after the type locality; sendero is the Spanish word for path.

Description. Female holotype. Carapace orange and black. Chelicerae brownish black. Labium, endites brown. Sternum brown. Coxae dusky orange, legs dark orange-brown. Dorsum of abdomen with a series of pairs of black brackets (Fig. 219). Venter with a black square (Fig. 220). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 2.2 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 11.0 mm. Carapace 4.6 mm long, 3.2 wide, 2.5 behind lateral eyes. First femur 3.5 mm, patella and tibia 4.5, metatarsus 3.1, tarsus 1.4. Second patella and tibia 3.9 mm, third 2.2, fourth 3.4.

Male. Coloration as in female, but venter of abdomen with scattered white pigment spots. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.4 diameter apart, 1.6 diameters from laterals. Posterior median eyes 0.4 diameter apart, 3.5 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior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Figures 216–221. *Metazygia sendero* n. sp. 216–220, female. 216–218, epigynum. 216, ventral. 217, posterior. 218, lateral. 219, dorsal. 220, abdomen, ventral. 221, left male palpus.

Figures 222–225. *M. uma* n. sp. 222–224, female. 222, 223, epigynum. 222, ventral. 223, posterior. 224, right, dorsal; left, abdomen, ventral. 225, male palpus.

Figures 226–230. *M. laticeps* (O. P.-Cambridge). 226–229, female. 226–228, epigynum. 226, ventral. 227, posterior. 228, dorsal. 229, abdomen, ventral. 230, male palpus.

Figures 231–238. *M. mundulella* Strand. 231–236, female. 231–235, epigynum. 231, ventral. 232, posterior. 233, lateral. 234, broken ventral. 235, broken posterior. 236, dorsal. 237, 238, palpus. 237, mesal. 238, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

median eye. Total length 6.5 mm. Carapace 3.2 mm long, 2.3 wide, 1.5 behind lateral eyes. First femur 2.5 mm, patella and tibia 3.1, metatarsus 2.3, tarsus 1.2. Second patella and tibia 2.7 mm, third 1.5, fourth 2.1.

Note. Males and females were matched because of similar coloration, a similar wide cephalic region and swelling behind the eyes, and similarly shaped abdomen. The only other species with these characters is *M. laticeps.* Male and female come from the opposite slopes of the Andes.

Variation. Total length of females 8.0 to 11.0 mm. Illustrations were made from the female holotype and a male from Tinalandia, Ecuador.

Diagnosis. The abdomen is elongate, oval, slightly overhanging spinnerets (Fig. 220). This species differs from *M. laticeps* by having the epigynum with a narrower triangle in ventral view (Fig. 216); in posterior view, the median plate is as wide as long (Fig. 217) while that of *M. laticeps* is narrow (Fig. 227). The median apophysis of the palpus (at 4 hr in Fig. 221) has two tips.

Distribution. Ecuador, Peru (Map 3B).

Specimens Examined. ECUADOR *Pichincha:* Tinalandia, 12 km E Santo Domingo de los Colorados, 750 m, beating vegetation, 11–17 May 1986, 1 imm., 1♀, 2♂ (G. B. Edwards, FSCA). PERU *Ucayali:* Colonia Calleria, Río Calleria, 15 km from Ucayali, 10–30 Sept. 1961, 1♀ (B. Malkin, AMNH).

Metazygia uma new species
Figures 222–225; Map 3B

Holotype. Female holotype from Puesto de Vigilancia Pakitza, Zona Reservada de Manu, Depto. Madre de Dios, 11°58′S, 71°18′W, Peru, inundated forest, 30 Sept. 1987 (D. Silva D., J. Coddington), in MUSM. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum orange. Coxae orange; legs orange but distal tips of tibiae, metatarsi and tarsi black. Dorsum of abdomen with longitudinal gray lines (Fig. 224); venter with a black rectangle (Fig. 225). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 3 diameters from laterals. Posterior median eyes 0.4 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 8.2 mm. Carapace 3.8 mm long, 2.5 wide, 2.3 behind lateral eyes. First femur 2.6 mm, patella and tibia 3.4, metatarsus 2.3, tarsus 1.1. Second patella and tibia 2.9 mm, third 1.7, fourth 2.7.

Male. Coloration as in female, but venter of abdomen all black. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.5. Anterior median eyes 0.8 diameter apart. Posterior median eyes 0.3 diameter apart. Coxal hook very small. Second tibia thicker than first with two long macrosetae in a line. Height of clypeus equals 1 diameter of anterior median eye. Total length 3.9 mm. Carapace 2.0 mm long, 1.4 diameters wide, 0.9 wide behind lateral eyes. First femur 1.4 mm, patella and tibia 1.8, metatarsus 1.2, tarsus 0.7. Second patella and tibia 1.5 mm, third 0.8, fourth 1.1.

Note. Male was matched with the female because of similar coloration and the relatively wide cephalic region of the carapace.

Diagnosis. This species is distinct in that the eye region of the carapace is almost as wide as the thoracic region (Fig. 224). The male differs from *M. laticeps* by the curved embolus lamella with a short curved embolus "above" it (Fig. 225). This strange-looking species is apparently a *Metazygia* and closest to *M. laticeps,* which has also the carapace relatively wide anteriorly (Fig. 228).

Natural History. The male was collected in forest interior.

Distribution. Amazon region, Peru to Brazil (Map 3B).

Specimens Examined. PERU *Madre de Dios:* Zona Reservada Tambopata, 290 m, 8 July 1987, 1♀ (D. Silva D., MUSM). BRAZIL *Amazonias:* Reserva Florestal, 80 km from Manaus, 19 Feb. 1991, 1♂ (H. Fowler, E. Venticinque, R. S. Vieira, MCZ).

Metazygia laticeps (O. P.-Cambridge), new combination
Figures 226–230; Map 3F

Epeira laticeps O. P.-Cambridge, 1889: 18, pl. 4, fig. 16, ♀. Female holotype from Bugaba, Panama, in BMNH no. 1890.7.1.5020, examined. Keyserling, 1892: 175, pl. 8, fig. 129, ♀.
Aranea laticeps:—F. P.-Cambridge, 1904: 516, pl. 49, fig. 21, ♀. Roewer, 1942: 845.
Araneus laticeps:—Bonnet, 1955: 527.

Note. The type specimen belonged to Keyserling. The vial containing the type also contains Keyserling's original, toothed, blue-bordered label, which is still faintly legible when dried. The first line reads Guatemala and not Bugaba.

Description. Female from Pipeline Road, Panama. Carapace dark orange with median double line, black on each side of thoracic region. Chelicerae, labium, endites orange. Sternum dusky orange-brown. Coxae light orange, legs dusky orange-brown. Dorsum of abdomen with pairs of brackets (Fig. 228); venter with median dark gray patch (Fig. 229). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 diameter apart, 2 diameters from laterals. Posterior median eyes 0.6 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 10.0 mm. Carapace 3.7 mm long, 3.1 wide, 2.2 behind lateral eyes. First femur 3.4 mm, patella and tibia 4.4, metatarsus 2.7, tarsus 1.3. Second patella and tibia 3.7 mm, third 2.2, fourth 3.2.

Male from Barro Colorado Island, Panama. Color as in female. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 2.5 diameters from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.4 diameter of anterior median eye. Abdomen as in female, but smaller. Total length 6.3 mm. Carapace 3.4 mm long, 2.5 wide, 1.7 behind lateral eyes. First femur 2.9 mm, patella and tibia 3.8, metatarsus 2.7, tarsus 1.2. Second patella and tibia 3.1 mm, third 1.7, fourth 2.5.

Note. Males and females were matched because both have a dusky patch on the venter of the abdomen (Fig. 229) and because both have the same wide distribution. Males are much less common in collections than females.

Variation. Total length of females 8.0 to 11.0 mm. Females and male from Mato Grosso, Brazil, differed from those of other regions: the female epigynum is more rounded posteriorly and in posterior view there is a round depression ventrally, but the lateral and median sclerites are of the same width as the one illustrated (Fig. 227). The male from Mato Grosso has a more elongate median apophysis, and the two parallel prongs of the embolus are of similar width.

Illustrations were made from a female from Pipeline Road, Panama, and a male from Barro Colorado Island, Panama.

Diagnosis. The abdomen is elongate oval (Fig. 228). *Metazygia laticeps* female has a pointed, wide, triangular epigynum (Fig. 226) with the posterior median plate slightly narrower than the lateral plates on each side (Fig. 227). The male has a large, semicircular median apophysis (at 5 hr in Fig. 230).

Natural History. Females are collected in tropical forest by unrolling rolled-up leaves, their retreat, at a height of about 150 cm. Specimens from Mato Grosso all came from gallery forest; Guyanas from forest savanna and swamp forest; and near Iquitos, Peru, from rain forest.

Distribution. Panama to Rio de Janeiro and northern Bolivia (Map 3F).

Specimens Examined. PANAMA *Colón:* Fort Sherman, 1♀ (MCZ). *Panamá:* nr. Gamboa, edge of Canal, 1948, 1♀ (W. Eberhard, MCZ); Soberania Natl. Park, Pipeline Road, 8 km NW Gamboa, 1♀ (MCZ); Barro Colorado Isl., Lago Gatún, 2♂, 2♀, MCZ.

TRINIDAD Port of Spain, 1♂ (MCZ). GUYANA Canje Ikuruwa River 05°70′N, 57°50′W, 1♀ (AMNH). FRENCH GUIANA nr. Placer Tresor, Roura Mtns., 1♀ (MCZ); nr. Sautero, Matouri, 1♀ (MCZ). COLOMBIA *Satander:* Río Suárez, 800–1,000 m, 1♀ (AMNH). PERU *Loreto:* Iquitos, 1♀ (AMNH); Explorama Lodge, 80 km NE Iquitos, 1♀ (FSCA). *San Martín:* 32 km SE Moyabamba, 1♂ (AMNH). *Junín:* Amable María, 1♀ (PAN). *Madre de Dios:* Zona Reservada Tambopata, 290 m, 1♀ (MUSM). BRAZIL *Pará:* Canindé, Rio Gurupi, 1♀ (AMNH). *Amazonas:* Tefé, 1♀ (S. Parrish, MCZ); Rio Negro, Umarituba, 1♀ (NRMS); Maturacá, 1♀ (MCP). *Espírito Santo:* Linhares, Parque Souterrana, 1♀ (MZSP). *Rio de Janeiro:* Rio de Janeiro, Jardim Botânico, 1♀ (MCZ); Parque da Cidade, 1♀ (MCZ). *Mato Grosso:* 260 km N Xavantina, 400 m, 12°49'S, 51°46'W, 3♀, 1♂ (MCZ). BOLIVIA *Beni:* Chacobo Indian Village, Río Benicito, 1♀ (AMNH); Est. Biologica Beni, 1♀ (USNM).

Metazygia mundulella Strand
Figures 231–238; Map 3F

Aranea (*Metazygia*) *mundulella* Strand, 1915: 114. Ten female, two male, and two immature syntypes from mud-dauber wasp nest, Joinville, Santa Catarina State, Brazil, in SMF no. 4010, examined.
Aranea mundulella:—Roewer, 1942: 848.
Larinia mundula:—Bonnet, 1957: 2350.

Note. Strand (1915: 114) wrote, "Since there is no certainty from the literature as to which species the specimens belong, I make some descriptive remarks and propose, if necessary, the name *mundulella.*"

Description. Female syntype. Carapace orange, cephalic region darker. Chelicerae, labium, endites dark orange. Sternum orange. Coxae, legs orange. Dorsum of abdomen light with a pair of dark anterior patches and four pairs of dark lines (Fig. 236). Venter light. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.5 diameter apart, 0.9 diameter from laterals. Posterior median eyes 0.3 diameter apart, 2.1 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.9 mm. Carapace 2.8 mm long, 2.1 wide, 1.4 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.6, metatarsus 1.8, tarsus 0.8. Second patella and tibia 2.3 mm, third 1.4, fourth 2.0.

Male syntype. Color, including marks on abdomen, as in female. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.5 diameter, posterior laterals 0.5. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.2 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Second tibia as thick as first, with macrosetae. Total length 4.5 mm. Carapace 2.4 mm long, 2.0 wide, 0.9 wide behind lateral eyes. First femur 2.1 mm, patella and tibia 2.7, metatarsus 1.9, tarsus 0.7. Second patella and tibia 2.3 mm, third 1.3, fourth 1.8.

Note. The syntypes have lost all white pigment and also the silver pigment of the eyes, perhaps from having been in a buffered formaldehyde solution (Levi, 1989). All except for one specimen (Figs. 231, 232) have the epigynum broken. Each side is broken off (Figs. 234, 235), apparently the result of mating. Males and females were collected together.

Diagnosis. The epigynum, unlike that of *M. genialis* (Fig. 239), has a concave margin on each side and a flat scape (Figs. 231, 233). In posterior view, it has a ventral pocket on each side (at 11 hr and 2 hr in Fig. 232). The male palpus, like that of *M. genialis* (Figs. 243, 244), has a lobe on the tegulum (at 12 hr in Figs. 237, 238) but differs in the shape of the embolus lamella and median apophysis (center and at 5 hr in Fig. 237).

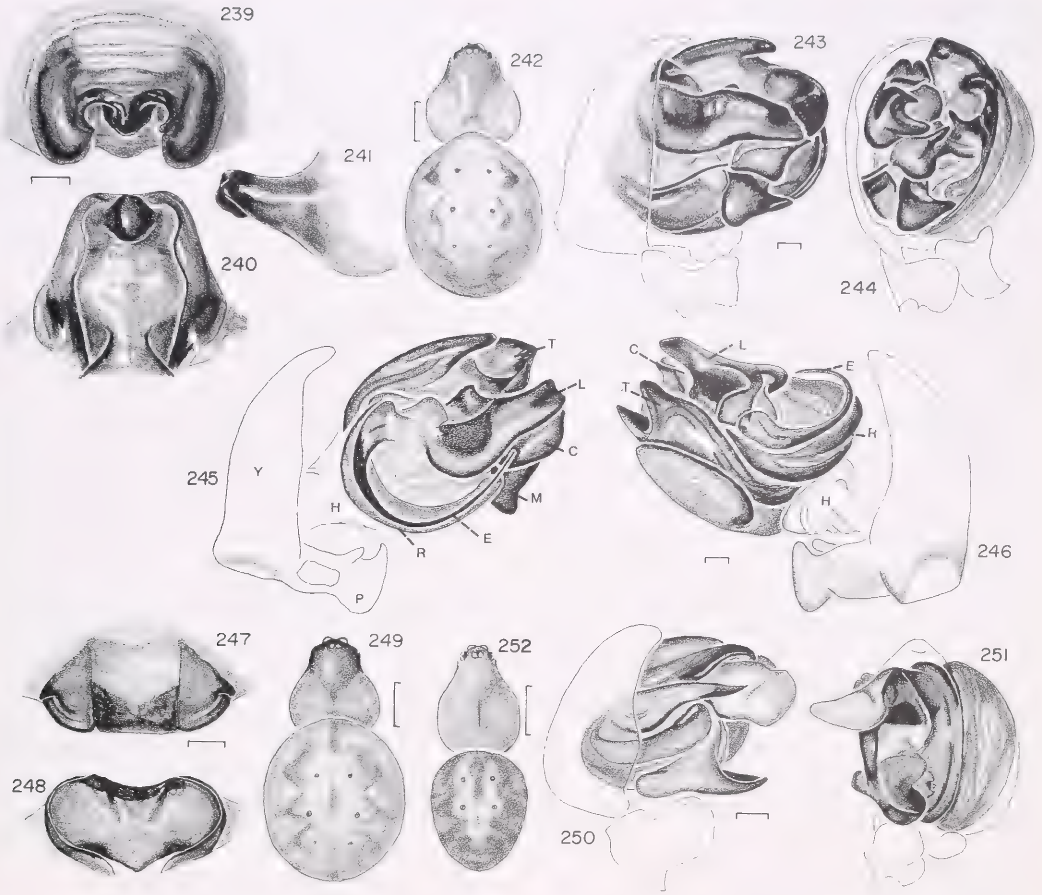
Natural History. All specimens came from a mud-dauber wasp nest.

Metazygia genialis (Keyserling)
Figures 239–246; Map 3F

Epeira genialis Keyserling, 1892: 156, pl. 8, fig. 114, ♀. Two female syntypes from Rio Grande do Sul, Brazil, one has the epigynum broken, the other covered by secretions, in BMNH, examined.
Epeira mundula:—Keyserling, 1892: 179, pl. 9, fig. 132, ♂ (not female lectotype).
Aranea genialis:—Roewer, 1942: 843.
Araneus genialis:—Bonnet, 1955: 507.
Metazygia genialis:—Levi, 1991a: 179.

Note. The male paralectotype of *E. mundula* belongs with the female of *M. genialis.*

Description. Female from Santa Vitória do Palmar, Rio Grande do Sul. Cephalic region of carapace dark brown, thoracic region yellowish. Chelicerae dark brown. Labium, endites dark brown. Sternum light brown. Coxae yellowish; legs with proxi-



Figures 239–246. *Metazygia genialis* (Keyserling). 239–242, female. 239–241, epigynum. 239, ventral. 240, posterior. 241, lateral. 242, dorsal. 243–246, left male palpus. 243, mesal. 244, ventral. 245, 246, palpus pulled apart.

Figures 247–249. *M. amalla* n. sp., female. 247, 248, epigynum. 247, ventral. 248, posterior. 249, dorsal.

Figures 250–252. *M. ikuruwa* n. sp., male. 250, 251, palpus. 250, mesal. 251, ventral. 252, dorsal.

Abbreviations. C, conductor; H, hematodocha; E, embolus; L. embolus lamella; M, median apophysis; P, paracymbium; R, radix; T, tegulum; Y, cymbium.

Scale lines. 1.0 mm, genitalia 0.1 mm.

mal articles yellowish, distal brown. Dorsum of abdomen with dusky outline of folium (Fig. 242); venter gray, without marks. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 1 diameter from laterals. Posterior median eyes 0.3 diameter apart, 3 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 6.3 mm. Carapace 3.0 mm long, 2.3 wide, 1.5 wide behind lateral eyes. First femur 2.2 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.8. Second patella and tibia 2.5 mm, third 1.7, fourth 2.1.

Male from Santa Vitória do Palmar, Rio Grande do Sul. Color as in female, but cephalic region yellowish. Posterior median eyes 0.5 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.4 diameter apart, 0.5 diameter from laterals. Posterior medians 0.2 their diameter apart, 2.2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Third femur with three short macrosetae; each only three times as long as wide. Total length 4.8 mm. Carapace 2.6 mm long, 2.2 wide, 1.1 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.7, metatarsus 2.2, tarsus 0.7. Second patella and tibia 2.4 mm, third 1.4, fourth 1.7.

Note. Males and females were collected together.

Variation. Total length of females 6.3 to 7.7 mm, males 4.8 to 5.8. Illustrations were made from Santa Vitória, Rio Grande do Sul, Brazil.

Diagnosis. The epigynum has a knob (Figs. 239, 240) rather than a flat scape as in *M. mundulella* (Figs. 231–235). The male, like *M. mundulella* (Figs. 237, 238), has a tegulum (T in Fig. 245) with a lobe (at 12 hr in Figs. 243, 245) and a distinctive shape of the embolus lamella (L in Fig. 245) and median apophysis (at 5 hr in Fig. 243).

Distribution. Bahia to Rio Grande do Sul States, Brazil (Map 3F).

Specimens Examined. BRAZIL *Bahia:* Mucuri, Fazenda Farol, 11 Apr. 1979, 1♂ (A. C. Viella, MCN 11108). *Rio Grande do Sul:* Santa Vitória do Palmar, Estação Ecológica do Taim, 9 Apr. 1986, 4♀, 1♂ (M. Rosenau, MCN 14821); Rio Grande, 4 Dec. 1986, 1♂ (A. D. Brescovit, MCN 16287); Guaíba, 9 Jan. 1980, 1♂ (M. H. Galileo, MCN 09182); Viamão, Fazenda Sanga da Porteira, 11–14 Apr. 1983, 2♀ (A. A. Lise, MCN 11565); Viamão, Lagoa do Casamento, 2 Apr. 1975, 1♀ (A. A. Lise, MCN 02644a); Viamão, Estação Exper. Fitotécnica de Aguas Belas, 30 Mar. 1977, 1♂ (E. H. Buckup, MCN 05567); Pelotas, May 1959, 1♂ (C. Biezanko, AMNH).

Metazygia amalla new species
Figures 247–249; Map 3D

Holotype. Female holotype from Pinhal, Est. Santa Catarina, Brazil, Jan. 1948 (A. Maller), in AMNH. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, cephalic region orange-brown. Chelicerae dark orange-brown. Labium, endites brown. Sternum orange. Coxae light orange, legs orange-brown. Dorsum of abdomen with faint dark markings forming outline of a folium (Fig. 249); venter light dusky. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1.1 diameters from laterals. Posterior median eyes 0.2 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 6.3 mm. Carapace 2.7 mm long, 2.1 wide, 1.1 wide behind lateral eyes. First femur 2.4 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.8. Second patella and tibia 2.3 mm, third 1.5, fourth 2.0.

Variation. Total length of females 6.3 to 6.5 mm. Illustrations were made from the female holotype. The holotype and paratype have the median area of the epigynum broken (Figs. 247, 248).

Diagnosis. Metazygia amalla differs from other species by the wide posterior median plate of the epigynum (Fig. 248).

Paratype. BRAZIL *Santa Catarina:* Pinhal, Jan. 1948, 2♀ (A. Maller, AMNH).

Metazygia ikuruwa new species
Figures 250–252; Map 3D

Holotype. Male holotype from Canje Ikuruwa River, 05°70′N, 57°50′W, Guyana, Aug.–Dec. 1961 (G. Bentley), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace orange. Chelicerae, labium, endites orange; sternum, coxae orange. Legs orange, distal articles darker. Dorsum of abdomen with dark outline of folium (Fig. 252); venter dusky. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 4.4 mm. Carapace 2.4 mm long, 1.7 wide, 0.8 wide behind lateral eyes. First femur 2.3 mm, patella and tibia 2.7, metatarsus 2.0, tarsus 0.9. Second patella and tibia 2.3 mm, third 1.3, fourth 1.9.

Diagnosis. This species differs from *M. gregalis* by the large anchor-shaped median apophysis (at 5 hr in Fig. 250).

Paratypes. GUYANA *Bartica:* Kartabo, 1920, 3♂ (CUC).

Metazygia gregalis (O. P.-Cambridge)
Figures 253–262; Map 3E

Epeira gregalis O. P.-Cambridge, 1889: 22, pl. 5, fig. 3, ♀. Ten female syntypes from Veragua [Prov. Veraguas], Panama in BMNH, examined. Keyserling, 1892: 177, pl. 9, fig. 131, ♀, ♂.

Metazygia gregalis:—F. P.-Cambridge, 1904: 501, pl. 47, fig. 24, ♀, ♂. Petrunkevitch, 1930: 327, figs. 208–210, ♀, ♂. Roewer, 1942: 868. Bonnet, 1957: 2819.

Eustala tuceps Chamberlin, 1925: 217. Female holotype from Barro Colorado Island [Lago Gatún], Panama, in MCZ, examined. Roewer, 1942: 767. First synonymized by Banks, 1929: 95.

Metazygia manni Bryant, 1945: 377, figs. 12, 13, 23, ♀, ♂. Male holotype from Cap Haitien, Haiti, in MCZ, examined. Brignoli, 1983: 274. NEW SYNONYMY.

Metazygia similis Caporiacco, 1947: 25; 1948: 660, fig. 70, ♀. Female holotype from Mackenzie, [06°00′N, 58°17′W], Guyana, in MZUF, examined. Brignoli, 1983: 274. NEW SYNONYMY.

Synonymy. The genitalia of *Metazygia manni* and *M. similis* are similar to those of *M. gregalis*. No differences could be found.

Description. Female from Panama. Carapace orange, cephalic region brown. Chelicerae brown. Labium, endites, sternum orange. Coxae orange; legs orange. Dorsum of abdomen with dusky pattern over tiny white pigment spots (Fig. 257); venter light dusky without marks. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.5 diameter apart. Height of clypeus equals 0.8 diameter of anterior median eye. Total length 8.0 mm. Carapace 3.5 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 2.7 mm, patella and tibia 3.2, metatarsus 2.4, tarsus 0.9. Second patella and tibia 2.9 mm, third 1.8, fourth 2.5.

Male from Panama. Color as in female. Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7 diameter, posterior laterals 0.6. Anterior median eyes 0.5 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart. Height of clypeus equals 0.6 diameter of anterior median eye. Fangs modified (Figs. 261, 262). Endite without tooth, palpal femur without facing tubercle. First coxa with very small hook. Second tibia thicker than first, without special macrosetae. Total length 5.0 mm. Carapace 2.9 mm long, 2.1 wide, 1.3 wide behind lateral eyes. First femur 2.4 mm, patella and tibia 2.8, metatarsus 2.1, tarsus 0.9. Second patella and tibia 2.3 mm, third 1.5, fourth 2.0.

Note. Males and females are commonly collected together.

Variation. Total length of females 6.2 to 9.6 mm, males 4.0 to 6.0. The largest male and female both came from Pelotas, Rio Grande do Sul State, Brazil. The epigynum is quite variable: sometimes the posterior two bulges are absent, sometimes there is a median bulge. The illustrations were made from specimens from Barro Colorado Island, Panama.

Diagnosis. The female epigynum in ventral view is wider than long (Figs. 253, 254); that of *M. benella* and *M. yobena* is longer than wide (Figs. 263, 270). The median apophysis (M) of the male palpus is a small hook (Figs. 258, 260); it is longer in *M. benella* (Fig. 267) and has a black wall in *M. yobena* (Fig. 274)

Natural History. Specimens have been collected from the following places: brush along fences, on houses, and eaves of a building in Costa Rica; on a building at night in Panama; on walls under light at night in Paraguay; in sweeping river vegetation in Bolivia; from a wasp nest in Surinam; and from rolled leaves in savanna, Depto. Beni, Bolivia.

Distribution. Nicaragua, Greater Antilles (except Jamaica), Tobago, south to Argentina (Map 3E).

Specimens Examined. NICARAGUA Bonanza (AMNH). COSTA RICA *Heredia:* Serapiquí (MCZ); La Selva (MCZ, USNM). *Cartago:* Turrialba (CAS). *Puntarenas:* Finca Selva Verde (DU). PANAMA *Chiriquí:* Puerto Armuelles (FSCA); David (AMNH, MCZ). *Veraguas:* NE Puerto Mutis (MIUP). *Herrera:* París (MCZ). *Coclé:* Natá (AMNH). *Colón:* Santa Rosa (AMNH); Fort Gulick (AMNH); Puente Sobre Represa Madden (MIUP); Madden Dam (AMNH, MCZ). *Panamá:* Reserva Forestal (MIUP); Barro Colorado Isl., Lago Gatún (CAS, MIUP); Frijoles (MCZ); Pedro Miguel (MCZ); Red Tank (MCZ).

CUBA *Santiago de Cuba:* Cuabitas (AMNH). HAITI Cap Haitien (MCZ). DOMINICAN REPUBLIC Santo Domingo, Jardin Botanico (MCZ); Cruce de Jima Abajo, La Vega (MNSD). PUERTO RICO Aguas Buenas (JEC); Caguas (AMNH); Adjuntas (AMNH); Humacao (MCZ); Laguna Cartagena, Valle de Leras (MCZ); Loma Tinaja, Laguna Cartagena (AMNH); Mayagüez (AMNH); Toa Baja (AMNH). TOBAGO Bucco Bay (AMNH).

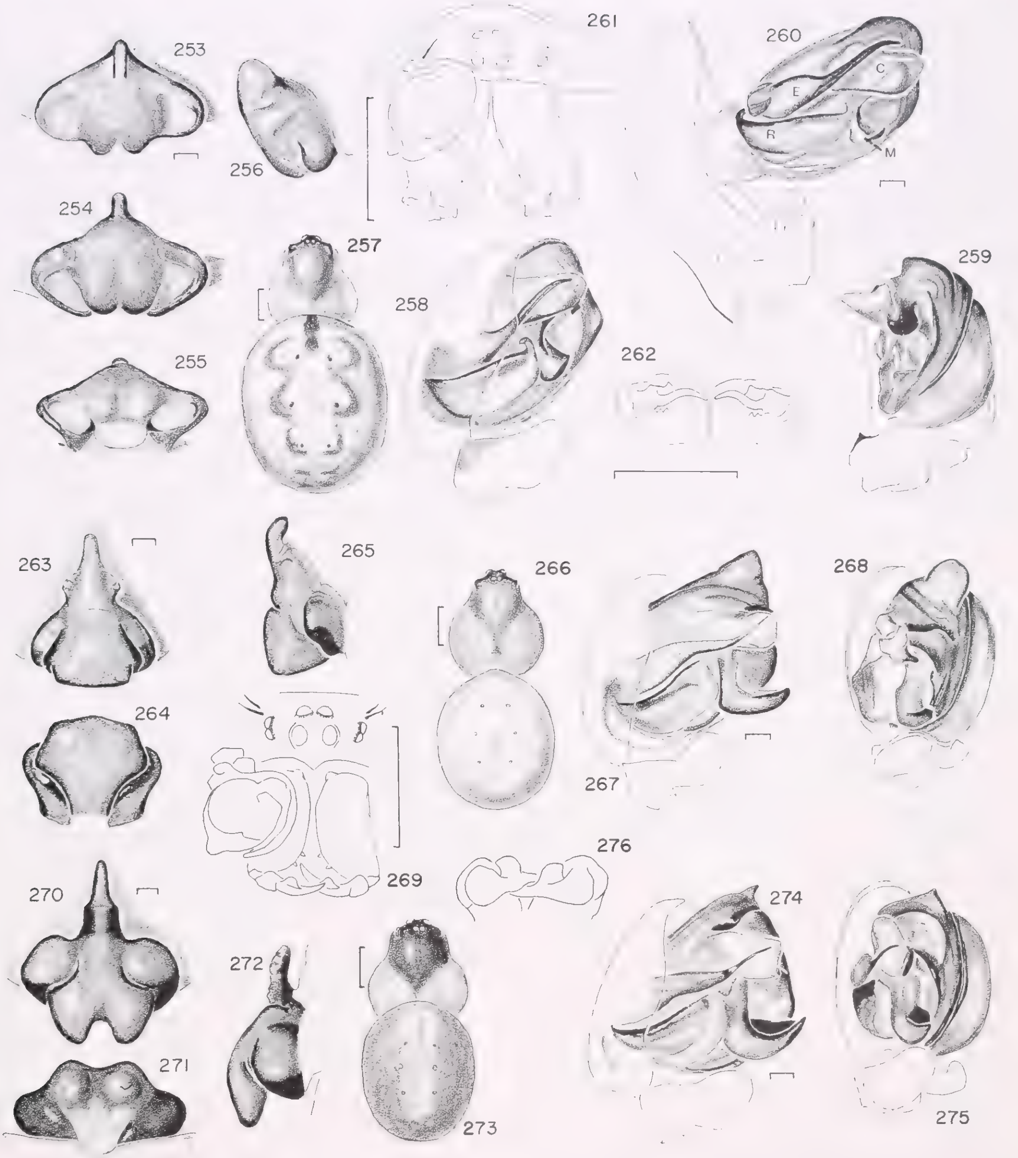
VENEZUELA *Sucre:* 7 km E San Antonio del Golfo (USNM). *Apuré:* Mantecal (MCZ). *Distrito Federal:* San José del Avila, Caracas (AMNH). GUYANA Kartabo (AMNH). SURINAM Brokopondo Lake (AMNH). FRENCH GUIANA St. Laurent de Maroni (PAN). COLORADO *Magdalena:* Pozo Colorado, 10 km W Santa Marta (AMNH). *Santander:* Río Suarez (AMNH). *Meta:* Carimagua (MCZ); El Porvenir, 140 m (MCZ); Finca Chenevo, 20 km N Río Muco, 20 km S El Porvenir (MCZ); Lomalinda, Puerto Lleras (CAS, MCZ); 15 km SW Puerto Lopez, Hda. Mozambique, 200 m (MCZ). *Valle:* Cali (AMNH, MCZ); Centr. Hidroelectr. Anchicayá (MCZ); Lago Calima, 1,300 m (MCZ); Palmira (CAS); Río Jamundí entre Cali y Jamundí (MCZ); Río Para, below Buenos Aires (MCZ); Río Tuluá, 1,100 m (MCZ); Sevilla (AMNH). ECUADOR *Sucumbíos:* Res. Fauna Cuyabeno, Laguna Grande (MCZ). *Manabi:* road betw. Crucita and Charapotó (MCZ). PERU *Loreto:* Estiron, Río Ampiyacu (AMNH); Alto Amazonas, Pastaza (MCZ); Iquitos airport (FSCA); Jenaro Herrera (MUSM); Río Putamayo (AMNH). *Cajamarca:* Jean (AMNH). *Tumbes:* Lechugal (PAN). *Piura:* San Lorenzo (MCZ); Guayaquil (CAS); Mallares, Río Chira (CAS); Sullaña (CAS). *Lambayeque:* pampa NW Oyotún (MCZ); UCA Yarina-Coche (IRSNB). *Ucayali:* Pucallpa (MUSM). *Huánuco:* Higueras, Las Lomas (CAS); Tingo María (AMNH); Monzón Valley, Tingo María (CAS). *Ancash:* Quillabamba (AMNH). BRAZIL *Amazonas:* Tefé (MCZ); Guajará, Rio Negro (AMNH); Lower Rio Negro (AMNH); Santo Antônio do Iça (MCN); Rio Xingu (MNRJ). *Acre:* mouth of Rio Embira, Rio Juruá (AMNH). *Rondônia:* Fazenda Rancho Grande, NE Cacaulandia (FSCA). *Mato Grosso:* Barra do Tapirapé (AMNH); Porto Velho, Rio Tapirapé (AMNH); Juan Pinheiros, Rio Tapirapé (AMNH). *Mato Grosso do Sul:* Corumbá (AMNH). *Minas Gerais:* Lavras (MCZ); Minas de Serinha, Diamantina (AMNH); Ubá (AMNH). *Rio de Janeiro:* Rio de Janeiro (MCZ). *São Paulo:* Botucatú (MZSP). *Paraná:* Cataratas de Iguaçu (MCZ); Ponta Grossa (AMNH). *Santa Catarina:* Blumenau (AMNH); Joaçaba (MZSP). *Rio Grande do Sul:* very common (MCN). URUGUAY *Maldonado:* Punta del Este (MCZ). *Colonia:* Punta Gorda (CAS). PARAGUAY *Central:* Aregua (CAS); Villeta (MCZ); Asuncion (FSCA). *Itapúa:* Antidia Natianda (MCZ). BOLIVIA *Pando:* Abuña (MCZ). *Beni:* Chacobo Indian Village, Río Benicito (AMNH); Estacion Biológica Beni, savanna, 50 km E San Borja (USNM); Espíritu, Yacuma (ZSM). ARGENTINA *Misiones:* San Javier (MLP). *Chaco:* Selva del Río de Oro (MEG). *Formosa:* Pto. Santos (MACN). *Santiago del Estero:* Santiago del Estero (MCZ).

Metazygia benella new species
Figures 263–269; Map 3C

Holotype. Female holotype, male paratype from near Cali, Valle, Colombia, ?1983 (W. Eberhard), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace light orange, cephalic region darker orange. Chelicerae orange-brown. Labium, endites dark orange. Sternum light orange. Coxae, legs light orange. Dorsum of abdomen white (Fig. 266); venter light dusky. Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.8 diameter, posterior laterals 0.7. Anterior median eyes 0.7 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.8 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 5.6 mm. Carapace 2.9 mm long, 2.3 wide, 1.5 wide behind lateral eyes. First femur 2.5 mm, patella and tibia 2.9, metatarsus 2.1, tarsus 1.0. Second patella and tibia 2.7 mm, third 1.3, fourth 2.3.

Male paratype. Color as in female. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.7 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Fangs modified (Fig. 269). Endite lacks tooth. Total length 5.0 mm. Carapace 2.5 mm long, 2.1 wide, 1.0 behind lateral eyes 1.0 wide. First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Figures 253–262. *Metazygia gregalis* (O. P.-Cambridge). 253–257, female. 253–256, epigynum. 253, ventral. 254, subposterior. 255, posterior. 256, lateral. 257, dorsal. 258–262, male. 258–260, left male palpus. 258, mesal. 259, ventral. 260, pulled apart. 261, eye region, chelicerae, and right palpus. 262, fangs from below.

Figures 263–269. *M. benella* n. sp. 263–266, female. 263–265, epigynum. 263, ventral. 264, posterior. 265, lateral. 266, dorsal. 267–269, male. 267, 268, palpus. 267, mesal. 268, ventral. 269, eye region, chelicerae, and right palpus.

Figures 270–276. *M. yobena* n. sp. 270–273, female. 270–272, epigynum. 270, ventral. 271, posterior. 272, lateral. 273, dorsal. 274–276, male. 274, 275, palpus. 274, mesal. 275, ventral. 276, fangs from below.

Abbreviations. C, conductor; E, embolus; M, median apophysis; R, radix.

Scale lines. 1.0 mm, genitalia 0.1 mm.

femur 2.1 mm, patella and tibia 2.5, metatarsus 2.0, tarsus 0.9. Second patella and tibia 2.3 mm, third 1.3, fourth 1.8.

Note. Males and females were collected together.

Variation. Most individuals have a folium pattern on the abdomen as in Figure 257. Total length of females 6.3 to 8.4 mm, males 4.2 to 5.1. Illustrations were made of the female holotype and male paratype collected with it.

Diagnosis. The female epigynum (Fig. 263) is longer than wide, lacks the posterior notch present in *M. yobena* (Fig. 270), and has a pair of lobes on the scape (at 10 hr and at 2 hr in Fig. 263). The male has a round tubercle on the tegulum (at 1 hr in Fig. 267), has a longer median apophysis (at 4 hr in Fig. 267) than *M. gregalis* (Fig. 258, M in Fig. 260), and is without the black posterior wall (Fig. 267) present in *M. yobena* (at 4 hr in Fig. 274).

Natural History. A male and female were collected in roadside shrubs at night near Cali, Colombia.

Distribution. Panama and Colombia (Map 3C).

Paratypes. COLOMBIA *Valle:* nr. Cali, 1,000 m, no date, 2♀ (W. Eberhard 759, 807, MCZ), 8 May 1973, 1♀ (W. Eberhard 513, MCZ), Feb. 1975, 1♀ (W. Eberhard 937, MCZ), 1973–1974, 1♂ (W. Eberhard, MCZ), 3 Mar. 1973, 1♀, 1♂ (H. Levi, W. Eberhard, MCZ); above Barrio Siloe, SW Cali, 3 July 1972, 1♂ (M. Corn, MCZ).

Specimens Examined. PANAMA *Panamá:* Barro Colorado Island, Lago Gatún, 25 Apr. 1946, 1♀ (T. C. Schneirla, AMNH), July 1950, 1♂; 19 July 1954, 1♂, Aug. 1954, 1♀, 14–18 Jan. 1958, 2♀, 6 Feb. 1958, 1♀, 18 Feb. 1958, 1♂ (A. M. Chickering, MCZ).

Metazygia yobena new species
Figures 270–276; Map 3C

Holotype. Female holotype, one female, and two male paratypes from Mitú, 188 m, Depto. Vaupés, Colombia, at night in bamboo, 20 Apr. 1979 (M. Barreto), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female from Cuyabeno, Sucumbíos Prov., Ecuador. Carapace brownish black, sides of thoracic region light orange. Chelicerae black. Labium, endites brown. Sternum yellowish, darker on each side. Coxae, legs dusty orange. Dorsum of abdomen with indistinct median lighter band (Fig. 273); venter dark dusky. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.5 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Total length 6.0 mm. Carapace 3.1 mm long, 2.2 wide, 1.3 wide behind lateral eyes. First femur 2.5 mm, patella and tibia 3.2, metatarsus 2.3, tarsus 1.1. Second patella and tibia 2.7 mm, third 1.6, fourth 2.3.

Male paratype. Color as in female. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.9 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Fangs modified (Fig. 276). Endite without tooth, palpal femur without facing tubercle. First coxa with small hook on its side. All legs with relatively long macrosetae. Total length 5.2 mm. Carapace 2.7 mm long, 2.1 wide, 1.1 wide behind lateral eyes. First femur 2.4 mm, patella and tibia 2.9, metatarsus 2.1, tarsus 0.9. Second patella and tibia 2.4 mm, third 1.5, fourth 2.0.

Note. Males and females were collected together.

Variation. Total length of females 4.9 to 7.5 mm, males 4.1 to 5.6. Most females have the folium pattern made up of pairs of brackets on the abdomen, which is typical of the genus (Fig. 257). Some male palpi have only a small tubercle or none on the tegulum of the palpus (at 1 hr in Fig. 274). Illustrations were made from a specimen from the Cuyabeno Reserve, Sucumbíos Prov., Ecuador, and from a palpus from a male collected in Depto. Vaupés, Colombia. Figure 276 was made from a specimen from near Manaus, Brazil.

Diagnosis. The epigynum (Fig. 270) differs from that of *M. gregalis* (Fig. 253) by being longer than wide and from that of *M. benella* (Fig. 263) by having a notch on the posterior margin (at 6 hr in Fig. 270). The palpus differs from that of the two similar species by having a black wall on the hook-shaped median apophysis of the palpus (at 4 hr in Fig. 274).

Natural History. Specimens came from bamboo in Colombia; from trees in a lake in the Cuyabeno Reserve, Ecuador; from trees in rain forest; from swamp plants in Peru; from forest savanna in Guyana; from falling into a canoe from overhanging vegetation in Venezuela; and from cerrado shrub in Mato Grosso, Brazil.

Distribution. Guyana and Amazon drainage (Map 3C).

Paratypes. COLOMBIA *Vaupés:* Mitú, at night in bamboo, 20 Apr. 1971, 1♀, 1♂ (M. Barreto, MCZ).

Specimens Examined. VENEZUELA *Amazonas:* middle Río Baria, 100 m (AMNH). GUYANA Kuyuwini River, from landing to Essequibo (AMNH); Upper Essequibo River (AMNH); Canje Ikuruwa River (AMNH); Kartabo (AMNH); Tumatumari (AMNH). FRENCH GUIANA Uassa [Uaçá, Brazil] (PAN). COLOMBIA *Meta:* Finca Chenevo, 20 km S El Porvenir (MCZ); Hacienda Mozambique, 15 km SW Puerto Lopez (MCZ); Lomalinda, 3°18′N, 73°22′W (CAS); Carimagua, 175 m (MCZ). *Amazonas:* Araracuara (CV); Río Pira, Apaporis, 0°25′S, 70°15′W (CAS). ECUADOR *Napo:* Coca, Río Napo (L. Peña, MCZ). *Sucumbíos:* Cuyabeno, common (MCZ, MECN). *Pastaza:* El Puyo, Río Pastaza, 900 m (CAS). PERU *Loreto:* Explorama Lodge, 25 km NE Iquitos (FSCA); Estiron Río Ampiacu (AMNH); Prov. Alto Amazonas, Pastaza (MCZ); Aquaitia (AMNH). *Amazonas:* Alto Río Comainas, Puesto de Vigilancia (D. Silva D., MUSM). *Huánuco:* Divisoria (AMNH); Monzón Valley, Tingo María (AMNH, CAS). *Junín:* Amable María (PAN). *Cuzco:* Chanchosmayo Valley (AMNH, CAS). *Madre de Dios:* Puerto Maldonado (AMNH); Zona Reserv. Tambopata, 12°50′S, 69°17′W (USNM); Zona Reserv. de Manu (MUSM); Alto Río Madre de Dios (D. Silva D., MUSM). BRAZIL *Amazonas:* Manaus, igapó Tarumã-Mirím (INPA); Rio Autaz, Santa Amélia (NRMS). *Pará:* Belém (MCZ); Aldeia Araçu, 20 km E Canindé (AMNH). *Rondônia:* Abunã (MCZ); Fazenda Rancho Grande, NE Cacaulandia (FSCA). *São Paulo:* Barueri (MZSP). BOLIVIA *Beni:* Espirítu, Yacuma (ZSM); Estacion Biol. Beni, 14°47′S, 66°15′W (USNM); 19.5 km S Rurrenabaque (USNM).

Metazygia voluptifica (Keyserling)

Figures 277–284; Map 3D

Epeira voluptifica Keyserling, 1892: 152, pl. 7, fig. 112, ♀, ♂. Female and male syntypes from Rio Grande [do Sul], Brazil, in BMNH, no. 1890.7.1.5041–5042, examined.

Epeira mundula Keyserling, 1892: 179, pl. 9, fig. 132, ♀, not ♂. Female lectotype, here designated, from Rio Grande do Sul, Brazil, in BMNH, no. 1890.7.1.5067, 5068, examined. NEW SYNONYMY.

Zilla punctata Keyserling, 1893: 305, pl. 15, fig. 225, ♀. Female holotype from Nova Friburgo, Brazil, lost. Not in BMNH, HECO, MCZ, NMW, USNM, ZMB. NEW SYNONYMY.

Larinia mundula:—Simon, 1905: 10. Roewer, 1942: 771. Bonnet, 1957: 2350.

Aranea voluptifica:—Roewer, 1942: 856.

Araneus voluptificus:—Bonnet, 1955: 631.

Metazygia mundula:—Harrod, Levi, and Leibensperger, 1991: 246.

Metazygia voluptifica:—Levi, 1991a: 180.

Note. Keyserling described this species several times, first as *Epeira voluptifica.* Keyserling's female has a bracket folium as in *M. gregalis* (Fig. 257) and the epigynum lacks a scape. The type vial of *Epeira mundula* has a toothed, blue-bordered, 23-by-30-mm label of Keyserling reading, "Rio Grande do Sul, *Epeira mundula* Keys." The female is chosen as the lectotype because Keyserling's illustration of the female is recognizable while that of the male is not. The female lectotype has the scape of the epigynum torn off, as is that of most specimens. The male in the type vial is one that I associated with *M. genialis.* A second vial of *E. mundula* with a female syntype has a similar label, 20 by 30 mm in size, and has also a different label with the number 1889.2.17. It also contains my typed label reading "♀, ♂ syntypes," added in 1974, when I examined the specimens and illustrated them. The type of *Zilla punctata* is lost, but the illustration of the epigynum matches this species. Keyserling gives the total length as 9.0 mm, larger than specimens I have examined.

Description. Female from Guaíba, Rio Grande do Sul. Carapace light orange, cephalic area darker. Chelicerae brown. Labium, endites orange. Sternum light orange. Coxae light orange; legs light orange, distal articles darker, dusky. Dorsum of abdomen with a pattern of paired lines or brackets (Fig. 282); venter with some white pigment behind epigynum. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 1 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.6 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.0 mm. Carapace 2.1 mm long, 1.6 wide, 0.9 wide behind lateral eyes. First femur 1.9 mm, patella and tibia 2.1, metatarsus 1.4, tarsus 0.7. Second patella and tibia 1.9 mm, third 1.1, fourth 1.6.

Male from Santa Vitória do Palmar. Color as in female, but less gray pigment on abdomen. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.7 their diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Second tibia thinner than first. Total length 4.5 mm. Carapace 2.1 mm long, 1.6 wide, 0.9 wide behind lateral eyes. First femur 2.2 mm, patella and tibia 2.7, metatarsus 2.0, tarsus 0.8. Second patella and tibia 2.4 mm, third 1.2, fourth 1.5.

Note. Males and females were matched because collections came from the same locality (Minas Serinha, Minas Gerais) and because the carapace was of similar length. The female from Mato Grosso was collected with a male *M. corumba*; the *E. mundula* lectotype was with a male *M. genialis.* However, Keyserling described the female of *E. voluptifica* together with a male that I consider here the correct match.

Variation. Most females have the scape torn off (Figs. 280, 281). Total length of females 4.8 to 7.3 mm, males 4.0 to 5.5. Illustrations of females were made from specimens from Guaíba, Rio Grande do Sul; the male from Santa Vitória do Palmar, Rio Grande do Sul.

Diagnosis. The female can be separated from others by the two almost round circles of the epigynum in ventral view (Figs. 277, 280). The female is distinguished from that of *M. viriosa* by the posterior median plate of the epigynum, which is slightly wider than each lateral plate (Figs. 278, 281). The male is separated from others by the black fold of the tegulum of the palpus, which is distally serrate (T at 12 hr in Fig. 283).

Natural History. A female was collected from grass and brush along a fence in Colombia.

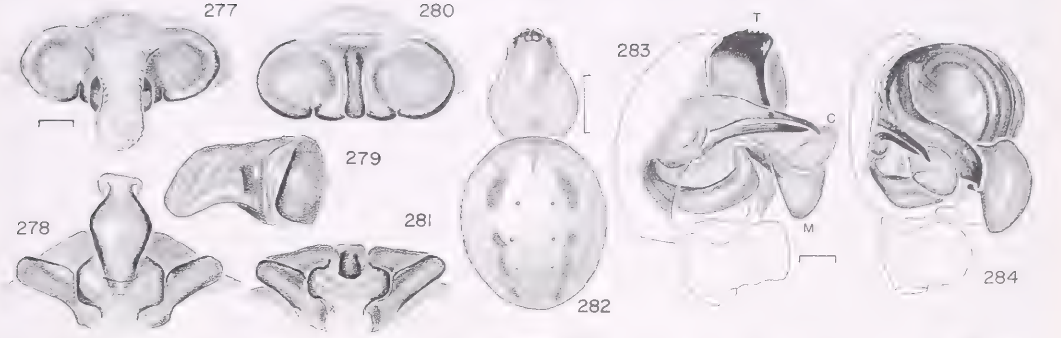
Distribution. Colombia to Argentina (Map 3D).

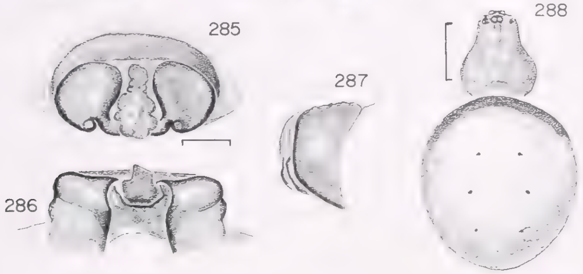
Specimens Examined. COLOMBIA *Meta:* Carimagua, Oct. 1973, 1♀ (W. Eberhard, MCZ). PERU *Madre de Dios:* Alto Río Madre de Dios, Playa Maronal campsite, 24 Sept. 1987, 1♂ (D. Silva D., MUSM). BRAZIL *Minas Gerais:* Diamantina, Minas de Serrinha, 1945, 9♀, 1♂ (E. Cohn, AMNH). *Mato Grosso do Sul:* Corumbá, 28–29 May 1960, 1♀ (B. Malkin, AMNH). *Rio Grande do Sul:* Encantado, 24 May 1986, 1♂ (A. D. Brescovit, MCN 15125); Santa Vitória do Palmar, Estação Ecológica do Taím, 26 Nov. 1985, 1♀ (M. Rosenau, MCN 14050), 9 Apr. 1986, 1♂ (M. Rosenau, MCN 14824); Guaíba, Granja Carola, 23 July 1986, 15♀ (M. A. L. Marques, MCN 15419); Triunfo 25 Jan. 1990, 1♂ (A. B. Bonaldo, MCN 19387); Porto Alegre, Vila Assunção, 27 July 1988, 1♀ (R. Richter, MCN 18003). ARGENTINA *Chaco:* Resistencia, 2♀ (MACN). *Corrientes:* Corrientes, 1♀ (Z. von Beneden, ZMK). *Entre Ríos:* Salto Grande, NE Concordia, Mar. 1964, 1♂ (M. E. Galiano, MEG).

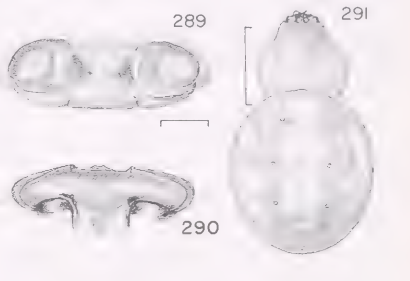
Metazygia viriosa (Keyserling), new combination
Figures 285–288; Map 3A

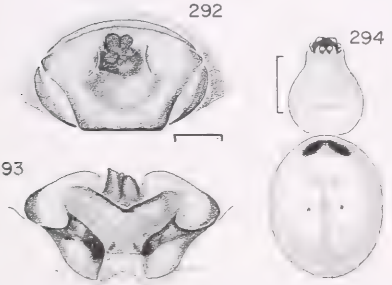
Epeira viriosa Keyserling, 1892: 165, pl. 8, fig. 122, ♀. Female holotype from Rio Grande do Sul, Brazil, in BMNH no. 1890.7.1.506, examined.
Aranea viriosa:—Roewer, 1942: 856.
Araneus viriosus:—Bonnet, 1955: 630.

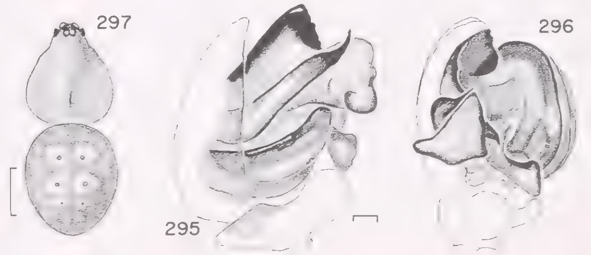
Description. Female holotype. Carapace orange-brown, cephalic region darkest. Chelicerae, labium, endites brown. Sternum dusky orange. Legs light orange. Dorsum of abdomen with anterior transverse black band (Fig. 288). Venter without marks or pigment. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes











Figures 277–284. *Metazygia voluptifica* (Keyserling). 277–282, female. 277–281, epigynum. 277, ventral. 278, posterior. 279, lateral. 280, ventral, scape torn off. 281, posterior, scape torn off. 282, dorsal. 283, 284, left male palpus. 283, mesal. 284, ventral.

Figures 285–288. *M. viriosa* (Keyserling), female. 285–287, epigynum. 285, ventral. 286, posterior. 287, lateral. 288, dorsal.

Figures 289–291. *M. ituari* n. sp., female. 289, 290, epigynum. 289, ventral. 290, posterior. 291, dorsal.

Figures 292–294. *M. limonal* n. sp., female. 292, 293, epigynum. 292, ventral. 293, posterior. 294, dorsal.

Figures 295–297. *M. tanica* n. sp., male. 295, 296, left palpus. 295, mesal. 296, ventral. 297, dorsal.

Scale lines. 1.0 mm, genitalia 0.1 mm.

0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Abdomen spherical (Fig. 288). Total length 4.8 mm. Carapace 1.7 mm long, 1.3 wide. First femur 1.7 mm, patella and tibia 2.1, metatarsus 1.4, tarsus 0.6. Second patella and tibia 1.8 mm, third 1.1, fourth 1.7.

Variation. All females had the scape of the epigynum torn off. Total length of females 4.6 to 5.4 mm. Illustrations were made from the female holotype; Figure 287 was made from a female from Jurubatuba.

Diagnosis. Metazygia viriosa differs from *M. voluptifica* by the markings of the abdomen (Fig. 288) and by the median posterior depression of the epigynum (Fig. 286).

Specimens Examined. BRAZIL *São Paulo:* Cocaia, Sept. 1950, 1♀ (H. Urban, MZSP 9662); Jurubatuba, 6 July 1941, 2♀ (P. F. S. Pereira, MZSP 9619). *Santa Catarina:* Pinhal, Jan. 1948, Dec. 1948, 6♀ (A. Maller, AMNH).

Metazygia ituari new species
Figures 289–291; Map 3D

Holotype. Female holotype from Utiarity (Utiariti), Est. Mato Grosso, Brazil, 1961 (H. Lenko) in MZSP no. 4155. The specific name is an arbitrary combination of letters.

Description. Female holotype. Cephalothorax light orange, only eyes with some black pigment. Dorsum of abdomen with three longitudinal white pigment bands (Fig. 291); venter with white pigment spots. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.6 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.8 diameters from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.4 diameter of anterior median eye. Abdomen (Fig. 291). Total length 3.1 mm. Carapace 1.3 mm long, 1.1 wide, 0.6 wide behind lateral eyes. First femur 1.1 mm, patella and tibia 1.2, metatarsus 0.7, tarsus 0.5. Second patella and tibia 1.1 mm, third 0.7, fourth 0.9.

Diagnosis. The female, which apparently has lost the scape of her epigynum, is separated from *M. voluptifica* and *M. viriosa* by the short, wide posterior median plate of the epigynum (Fig. 290).

Metazygia limonal new species
Figures 292–294; Map 4A

Holotype. Female holotype from El Limonal, Alto Río Madre de Dios, Depto. Madre de Dios, night collecting, 21 June 1988 (P. Lozada), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace very light orange, black only between eyes. Chelicerae, labium, endites light orange. Sternum light orange. Legs light orange. Dorsum of abdomen white with anterior dumbbell-shaped black marks (Fig. 294); venter with a white square. Posterior median eyes same diameter as anterior medians, anterior laterals 0.7 diameter, posterior 0.6. Anterior median eyes 0.7 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.2 mm. Carapace 1.7 mm long, 1.3 wide, 0.8 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.4, metatarsus 1.7, tarsus 0.7. Second patella and tibia 2.1 mm, third 1.2, fourth 1.8.

Variation. All females examined had the scape of the epigynum torn off (Figs. 292, 293). Total length of females 3.0 to 4.2 mm. Illustrations were made from the female holotype.

Diagnosis. Metazygia limonal differs from others by the Y-shaped posterior median plate of the epigynum (Fig. 293).

Distribution. From Depto. Madre de Dios, Peru, to northern Argentina (Map 4A).

Specimens Examined. BRAZIL *Rio Grande do Sul:* Santa Rosa, May 1955, 2♀ (C. Biezanko, AMNH). ARGENTINA *Misiones:* Puerto Rico, Dec. 1943, 1♀ (MACN).

Metazygia tanica new species
Figures 295–297; Map 4A

Holotype. Male holotype from Botanical Gardens, Georgetown, Guyana, 22 Feb. 1959 (A. Nadler), in AMNH. The specific name is an arbitrary combination of letters.

Description. Male holotype. Cephalothorax orange, sternum lighter. Dorsum of abdomen light with faint dusky outline of folium (Fig. 297); venter light. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. Endite with minute tooth. Total length 4.2 mm. Carapace 2.5 mm long, 1.9 wide, 0.9 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.7, metatarsus 2.0, tarsus 0.9. Second patella and tibia 2.4 mm, third 1.5, fourth 2.0.

Diagnosis. This male differs from *M. voluptifica* by having a structure (embolus or embolus lamella) of the palpus in a diagonal position with its sides almost parallel (Fig. 295).

Metazygia vaupes new species
Figures 298–302; Map 4A

Holotype. Female holotype from Mitú, Depto. Vaupés, 200 m, Colombia, Feb. 1975 (P. A. Schneble), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace yellowish. Chelicerae, labium, endites yellowish. Sternum yellowish. Legs yellowish. Dorsum of abdomen without color but with white pigment spots around anterior and sides (Fig. 301); venter with white pigment spots. Posterior median eyes 1.2 diameters of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart, 0.8 diameter from laterals. Ocular quadrangle square. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 3.1 mm. Carapace 1.17 mm long, 1.04 wide, 0.54 behind lateral eyes. First femur 1.52 mm, patella and tibia 1.82, metatarsus 1.35, tarsus 0.48. Second patella and tibia 1.53 mm, third 0.87, fourth 1.26.

Male from Depto. Loreto, Peru. Color as in female but anterior white band of abdomen less distinct. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.6 diameter of anterior median eye. First coxa with small hook. Second tibia thicker than first, with one long macroseta and several short ones distally, all in one line. Total length 2.0 mm. Carapace 1.2 mm long, 0.9 wide, 0.4 wide behind lateral eyes. First femur 1.4 mm, patella and tibia 1.7, metatarsus 1.2, tarsus 0.5. Second patella and tibia 1.3 mm, third 0.7, fourth 1.0.

Note. Males and females were collected in the same location in Rondônia, and both lack dark pigment dorsally on the abdomen.

Variation. Total length of females 3.1 to 3.2 mm. Illustrations were made from the female holotype and a male from Rondônia.

Diagnosis. The abdomen appears heart-shaped (Fig. 301). The epigynum is very distinct with a short rounded scape (Figs. 298, 299). The male has a shorter, smaller embolus lamella (Fig. 302) than *M. castaneoscutata* (Fig. 308).

Natural History. Specimens have been collected in grass and shrubs in Loreto, Peru, and rain forest in Rondônia, Brazil.

Distribution. Amazon region (Map 4A).

Specimens Examined. PERU *Loreto:* Río Manatee, 18 July 1989, 1♂ (G. B. Edwards, FSCA). *Huánuco:* Monzón Valley, Tingo María, 23 Sept. 1954, 1♀ (E. I. Schlinger, E. S. Ross, CAS). BRAZIL *Rondônia:* Fazenda Rancho Grande, NE Cacaulandia, 6–15 Dec. 1990, 1♀, 1♂ (G. B. Edwards, J. E. Eger, FSCA).

Metazygia castaneoscutata (Simon)
Figures 303–308; Map 4B

Araneus castaneoscutatus Simon, 1895: 806. Female holotype from Amazonas [specimen labeled as coming from Iquitos to Pebas, Peru], in MNHN, examined. Bonnet, 1955: 452.
Aranea castaneoscutata:—Roewer, 1942: 838.
Metazygia castaneoscutata:—Levi, 1991a: 177.

Description. Female holotype. Carapace light orange with a median black band. Chelicerae black. Labium, endites, sternum light orange. Legs dusky orange. Dorsum of abdomen with black band around anterior, continuing around sides of abdomen and meeting black ring around spinnerets (Figs. 306, 307); a narrow band of white pigment spots parallel to band on dorsum and a median dorsal dusky patch.

Venter with a dusky T-shaped mark and a black ring around spinnerets (Fig. 307). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.3 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.2 diameter apart, 0.8 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 3.4 mm. Carapace 1.2 mm long, 1.0 wide, 0.5 wide behind lateral eyes. First femur 1.3 mm, patella and tibia 1.5, metatarsus 1.0, tarsus 0.4. Second patella and tibia 1.3 mm, third 0.7, fourth 1.1.

Male from Alto Río Comaina. Color as in female. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.2 diameter apart, almost touching laterals. Posterior median eyes 0.2 diameter apart, 0.8 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Fourth coxa with a tiny macroseta on left side only. Second tibia thicker than first, both first and second with macrosetae. Total length 2.1 mm. Carapace 1.2 mm long, 0.9 wide, 0.5 behind lateral eyes. First femur 1.1 mm, patella and tibia 1.3, metatarsus 0.8, tarsus 0.4. Second patella and tibia 1.1 mm, third 0.6, fourth 0.8.

Note. Males and females were matched because of similar color and markings and because they were collected together.

Variation. The scape of the epigynum may be broken off (Fig. 304). Total length of females 3.1 to 4.5 mm, males 2.1 to 2.3. Illustrations were made from a female from the Tambopata Reservation and a male from Alto Río Comaina.

Diagnosis. Metazygia castaneoscutata can be separated from others by the spherical abdomen (Fig. 306) and its coloration. The epigynum has a longer scape (Fig. 303) than *M. vaupes* (Fig. 298) and a differently shaped posterior median plate (Fig. 305). The male has a longer embolus lamella (at 10 hr in Fig. 308) and more distinct conductor (center of Fig. 308) than *M. vaupes* (Fig. 302).

Natural History. Specimens came from forest interior near Manaus.

Distribution. Amazon region (Map 4B).

Specimens Examined. PERU *Amazonas:* Alto Río Comaina, Puesto da Vigilancia 22, Falso Paquisha, 850–1,150 m, Cordillera del Cóndor, 24 Oct. 1987, 1♂, 28 Oct. 1987, 1♀, 1♂ (D. Silva D., MUSM). *Madre de Dios:* Zona Reservada Tambopata, trocha principal, 290 m, 12°50′S, 69°17′W, 13–29 May 1988, 2♀ (D. Silva D., MUSM). BRAZIL *Amazonas:* Reserva Ducke, Manaus, 26 Mar. 1974, 1♀ (L. P. Albuquerque, MCN 20047); Reserva Campina, 22 Jan. 1973, 1♀ (MCN 20053); Reserva Cabo Frío, 80 km from Manaus, 23 Jan. 1991, 1♀; Colosso Reserve, 80 km from Manaus, 19 Mar. 1991, 1♂, 1♀, 4 June 1991, 1♀; Reserva Dimona, 80 km from Manaus, 26, 27 Mar. 1991, 3♀, 14, 15 May 1991, 2♀; km 41 Reserve, 80 km from Manaus, 17 Apr. 1991, 1♀ (all H. Fowler, E. Venticinque, R. S. Vieira, MCZ). *Mato Grosso:* Sinop, Oct. 1975, 1♀ (M. Alvarenga, AMNH); Jacaré, Xingu, Nov. 1961, 1♂ (Werner, AMNH).

Metazygia octama new species

Figures 309–313; Map 4B

Holotype. Female holotype from near Cali, 1,000 m elev., Depto. Valle, Colombia (W. Eberhard, no. 821), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, eye region black, thoracic region lightest. Chelicerae, labium, endites orange. Sternum orange. Legs orange. Abdomen white with a black band around anterior (Fig. 312), venter with a white square between epigynum and spinnerets. Posterior median eyes 0.9 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.6 diameter apart, 0.4 diameter from laterals. Posterior median

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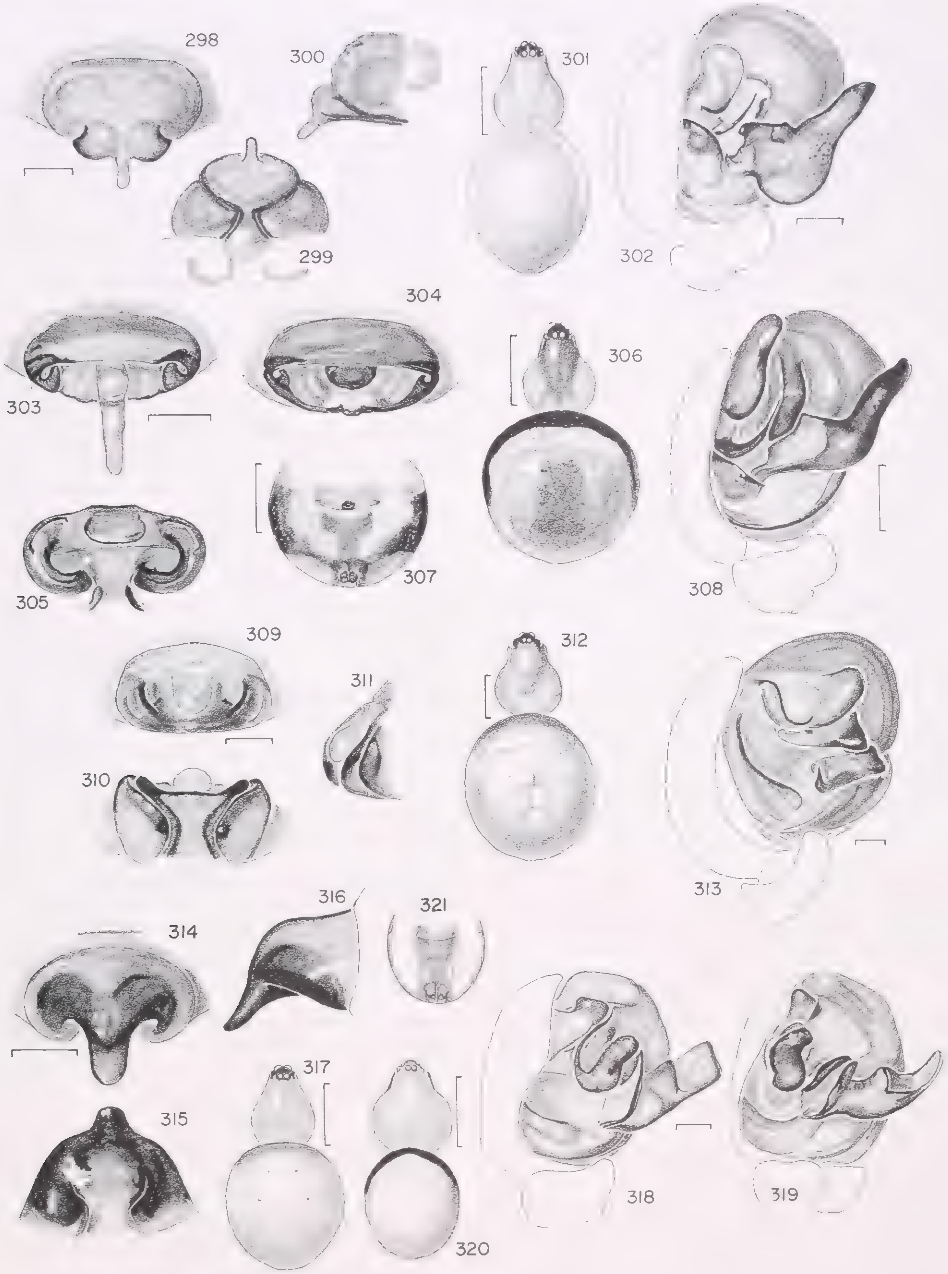
Figures 298–302. *Metazygia vaupes* n. sp. 298–301, female. 298–300, epigynum. 298, ventral. 299, posterior. 300, lateral. 301, dorsal. 302, left male palpus.

Figures 303–308. *M. castaneoscutata* (Simon). 303–307, female. 303–305, epigynum. 303, ventral. 304, ventral, scape torn. 305, posterior. 306, dorsal. 307, abdomen, ventral. 308, male palpus.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Figures 309–313. *M. octama* n. sp. 309–312, female. 309–312, epigynum. 309, ventral. 310, posterior. 311, lateral. 312, dorsal. 313, male palpus.

Figures 314–317. *M. floresta* n. sp., female. 314–316, epigynum. 314, ventral. 315, posterior. 316, lateral. 317, dorsal.

Figures 318–321. *M. mariahelenae* n. sp., male. 318, 319, palpus. 318, mesal. 319, ventral. 320, dorsal. 321, abdomen, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

eyes 0.3 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 5.5 mm. Carapace 2.1 mm long, 1.6 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.5, metatarsus 2.0, tarsus 0.7. Second patella and tibia 2.3 mm, third 1.4, fourth 2.0.

Male from type locality. Color as in female. Carapace with slight lobe. Posterior median eyes same diameter as anterior medians, anterior laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.1 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Third and fourth coxa each with one long macroseta. Second tibia thicker than first, with several large macrosetae. Total length 3.7 mm. Carapace 1.6 mm long, 1.3 wide, 0.5 wide behind lateral eyes. First femur 1.7 mm, patella and tibia 2.2, metatarsus 1.7, tarsus 0.6. Second patella and tibia 1.5 mm, third 1.0, fourth 1.5.

Note. Males and females were collected together.

Variation. Total length of females 4.1 to 5.1 mm, males 3.1 to 3.7. Illustrations were made from the female holotype and a male paratype.

Diagnosis. Metazygia octama females have a thicker epigynal scape (Figs. 309, 310) than *M. vaupes* (Fig. 298) and *M. castaneoscutata* (Fig. 303). In males the palpus has a hair-like, S-shaped embolus that lies between the transparent lamella and conductor (between center and at 11 hr in Fig. 313).

Natural History. A female and immatures were collected at night on a roadside shrub near Cali, Colombia. When living they were dark green with reddish first pair of legs.

Distribution. From Panama to Depto. Madre de Dios, Peru (Map 4B).

Paratypes. COLOMBIA *Valle:* nr. Cali, 3 Mar. 1973, 2 imm., 1♀ (H. Levi, W. Eberhard, MCZ), 1973–1974, 1♀, 5♂, 1976, 1♂, 1977, 1♂, 1983, 3♂ (W. Eberhard, MCZ), no dates, 3♀, 1♂ (W. Eberhard no. 660, 667, 956, MCZ).

Specimens Examined. PANAMA *Panamá:* Forest Reserve, Aug. 1936, 1♂ (A. M. Chickering, MCZ). PERU *Madre de Dios:* 15 km E Puerto Maldonado, 26 Feb. 1989, 1♀ (D. Silva D., MUSM).

Metazygia floresta new species
Figures 314–317; Map 4B

Holotype. Female holotype from Floresta dos Macacos, Est. Guanabara [Est. Rio de Janeiro], Brazil, Feb. 1961 (M. Alvarenga), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, eye region black. Chelicerae brown. Labium, endites dusky orange. Sternum orange. Legs orange. Dorsum of abdomen white with a dark band around the anterior (Fig. 317). Venter with a large white square between epigynum and spinnerets. Eyes large. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 3.8 mm. Carapace 1.5 mm long, 1.0 wide, 0.5 behind lateral eyes. First femur 1.6 mm, patella and tibia 1.9, metatarsus 1.3, tarsus 0.5. Second patella and tibia 1.6 mm, third 0.9, fourth 1.3.

Diagnosis. Abdomen subspherical, flatter anteriorly, and slightly pointed posteriorly (Fig. 317). This female differs from all others in the smooth, sclerotized scape (Figs. 314–316) with fused plates in posterior view (Fig. 315).

Specimens Examined. BRAZIL *Rio de Janeiro:* Nova Iguaçu, Miguel Couto, July 1961, 1♀ (M. Alvarenga, AMNH).

Metazygia mariahelenae new species
Figures 318–321; Map 4C

Holotype. Male holotype from Reserva Ducke, Manaus, Est. Amazonas, Brazil, Aug. 1971 (M. E. Galiano), in MACN. The species is named after the collector.

Description. Male holotype. Carapace light orange, eye region dusky. Chelicerae dusky. Labium, endites dusky. Sternum dusky light orange. Legs light orange, distally dusky. Dorsum of abdomen white with black band around anterior (Fig. 320). Venter with white longitudinal band on each side of genital furrow (Fig. 321). Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.7 diameter, posterior 0.5. Anterior median eyes their diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.4 diameter apart, their diameter from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.6 diameter of anterior median eye. Fourth coxa with short macroseta. Second tibia thicker than first, with three to four strong macrosetae on distal quarter. Total length 2.8 mm. Carapace 1.4 mm long, 1.1 wide, 0.5 behind lateral eyes. First femur 1.5 mm, patella and tibia 2.0, metatarsus 1.5, tarsus 0.5. Second patella and tibia 1.4 mm, third 0.9, fourth 1.3.

Diagnosis. The male is distinguished by an embolus that points clockwise (center of Fig. 318) and a median apophysis that is rectangular in ventral view (at 3 hr in Fig. 318).

Metazygia nigrocincta (F. P.-Cambridge), new combination
Figures 322–327; Map 4G

Aranea nigrocincta F. P.-Cambridge, 1904: 513, pl. 49, figs. 11, 12, ♀, ♂. Female and male syntypes from Bugaba, Panama, in BMNH, lost. Roewer, 1942: 848.

Araneus nigrocinctus:—Bonnet, 1955: 550.

The types are lost. F. P.-Cambridge's illustration fits this species.

Description. Female from Fortín de los Flores, Veracruz, Mexico. Carapace orange, eye region black. Chelicerae dark brown. Labium, endites dark dusky orange. Sternum dusky orange. Coxae orange; legs dark dusky on orange. Dorsum of abdomen white with a black band across anterior (Fig. 525); venter with a white square (Fig. 326). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.6 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.0 mm. Carapace 1.9 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 1.8 mm, patella and tibia 2.3, metatarsus 1.5, tarsus 0.6. Second patella and tibia 2.0 mm, third 1.2, fourth 1.7.

Male from Veracruz, Mexico. Color as in female. Carapace with small lobes. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.2 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. First coxa with large hook, third and fourth each with a short macroseta. Total length 2.7 mm. Carapace 1.4 mm long, 1.2 wide, 0.6 behind lateral eyes. First femur 1.6 mm, patella and tibia 1.8, metatarsus 1.2, tarsus 0.5. Second patella and tibia 1.5 mm, third 0.9, fourth 1.3.

Note. Males and females were collected together.

Variation. Total length of females 3.8 to 4.7 mm, males 2.5 to 2.7. Some males have macrosetae on the fourth coxae only, not on the third. Specimens from Jalisco, Mexico, have two white spots on the underside of the abdomen. Illustrations were made from specimens from Veracruz, Mexico.

Diagnosis. The female's abdomen is subspherical, widest anteriorly (Fig. 325). Females of this species are distinguished from those of *M. lagiana* (Figs. 328, 329) by having a thin, straight epigynal scape (Fig. 322) and a Y-shaped posterior median plate with openings at the end of the arms (Figs. 323, 328, 329). The male's palpus has an undulating median apophysis (Fig. 327) that is similar to that of *M. castaneoscutata* (Fig. 308) but is narrower at its base. The embolus lamella of this species (at 11 hr in Fig. 327) does not extend beyond the cymbium tip as it does in *M. castaneoscutata.*

Distribution. Mexico to Panama (Map 4G).

Specimens Examined. MEXICO *San Luis Potosí:* Tamanzunchale, 27 Sept. 1939, 1♀ (C. M. Bogert, H. E. Vokes, AMNH). *Jalisco:* 16.3 km NE La Huerta, 6 Aug. 1967, 1♀ (R. E. Leech, REL); Esta. Biol. Chamela, 100 m, Sept. 1988, 2♀, 3♂, Sept. 1990, 1♀ (W. Eberhard, MCZ). *Veracruz:* Fortín de las Flores, 18°53′N, 96°53′W, 25 Apr. 1963, 1♀ (W. Gertsch, W. Ivie, AMNH); Tlapacoyan, 300 m, 7, 8 July 1946, 2♂ (H. Wagner, AMNH); Los Tuxtlas Biol. Sta., 9–29 July 1990, 1♀ (B. Traw, MCZ); Canyon of Río Metlac, nr. El Fortín [?], 17 Dec. 1948, 1♀ (H. B. Leech, CAS). HONDURAS Tela, 1–17 Apr., 1♂ (F. Dybas, AMNH). PANAMA *Chiriquí:* Boquete, July 1939, 1♀ (A. M. Chickering, MCZ).

Metazygia lagiana new species
Figures 328–332; Map 4C

Holotype. Female holotype from Cataratas de Iguaçú, Misiones Prov., Argentina, 5 Oct. 1963 (M. E. Galiano), in MACN. The species name is an arbitrary combination of letters.

Description. Female. Carapace shiny with head black grading into the orange sides of the thoracic region. Chelicerae, labium, endites dark brown. Sternum black. Coxae yellow; legs yellow with black ring around end of first tibiae. Dorsum of abdomen white, with black band around anterior and black spots posteriorly (Fig. 330); venter with black median band from pedicel to and enclosing spinnerets (Fig. 331). Posterior median eyes 1 diameter of anterior medians, anterior laterals 1 diameter, posterior 0.8. Anterior median eyes their diameter apart, 0.7 from laterals. Posterior median eyes 0.5 their diameter apart, 1.7 from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 4.0 mm. Carapace 1.5 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 1.5 mm, patella and tibia 1.9, metatarsus 1.2, tarsus 0.6. Second patella and tibia 1.6 mm, third 1.0, fourth 1.4.

Male paratype. Color differs from that of female: carapace orange with eye region black, sternum orange. Abdomen with anterior black band, venter with a wider than long white rectangle. Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.5 diameter, posterior laterals 0.4. Anterior median eyes 0.8 diameter apart, 0.8 from laterals. Posterior median eyes 0.3 diameter apart, slightly more than one from laterals. First coxae with large hook on venter, third and fourth each with a macroseta. Second tibiae thicker than first with long macroseta almost in middle on venter. Total length 2.9 mm. Carapace 1.7 mm long, 1.4 wide. First femur 1.8 mm, patella and tibia 2.2, metatarsus 1.6, tarsus 0.6. Second patella and tibia 1.5 mm, third 0.9, fourth 1.4.

Note. Male and female were collected at the same locality.

Variation. Total length of females 3.7 to 4.0 mm.

Diagnosis. The female differs from that of *M. nigrocincta* by having an epigynal scape that is thin, bent, and transparent (Fig. 328) and a posterior median plate upside-down heart-shaped (Fig. 329). The male palpus features a knob-shaped median apophysis (at 4 hr in Fig. 332).

Natural History. A female has been collected in cerrado scrub in Mato Grosso, Brazil.

Distribution. Depto. Madre de Dios, Peru, to northern Argentina (Map 4C).

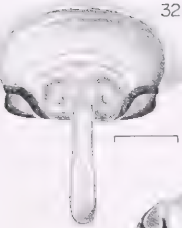
Paratypes. ARGENTINA *Misiones:* Gral. Belgrano, Jan. 1966, 1♀; Dec. 1972, 1♂ (M. E. Galiano, MACN).

→

Figures 322–327. *Metazygia nigrocincta* (F. P.-Cambridge). 322–326, female. 322–324, epigynum. 322, ventral. 323, posterior. 324, lateral. 325, dorsal. 326, abdomen, ventral. 327, left male palpus.

Figures 328–332. *M. lagiana* n. sp. 328–331, female. 328, 329, epigynum. 328, ventral. 329, posterior. 330, dorsal. 331, abdomen, ventral. 332, male palpus.

Figures 333–336. *M. carimagua* n. sp., female. 333–335, epigynum. 333, ventral. 334, posterior. 335, lateral. 336, dorsal.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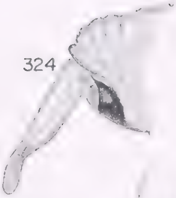
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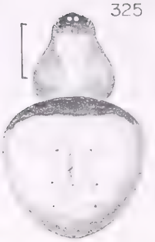
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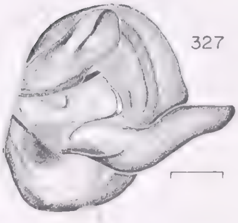
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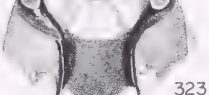
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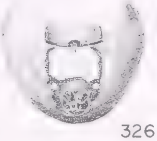
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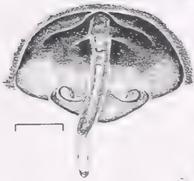
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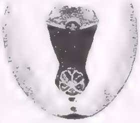
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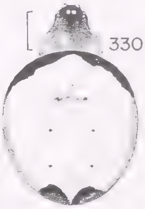
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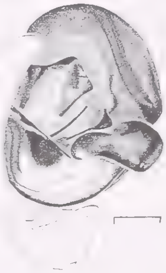
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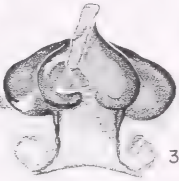
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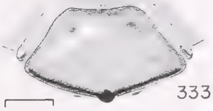
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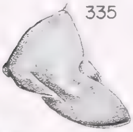
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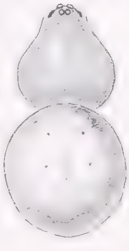
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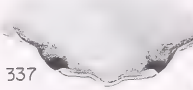
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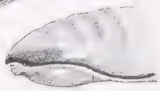
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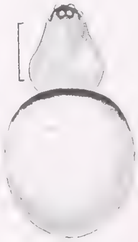
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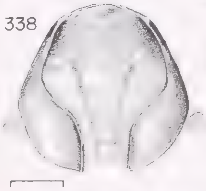
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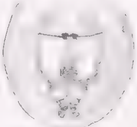
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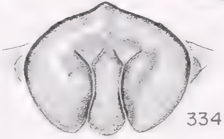
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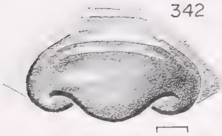
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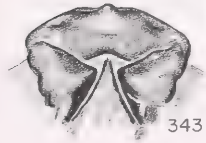
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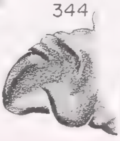
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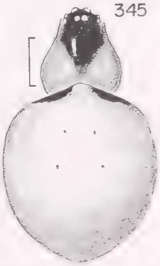
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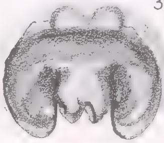
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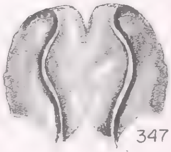
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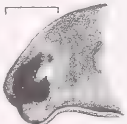
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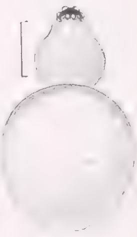
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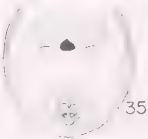
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Figures 337–341. *M. loque* n. sp., female. 337–339, epigynum. 337, ventral. 338, posterior. 339, lateral. 340, dorsal. 341, abdomen, ventral.

Figures 342–345. *M. cienaga* n. sp., female. 342–344, epigynum. 342, ventral. 343, posterior. 344, lateral. 345, dorsal.

Figures 346–350. *M. souza* n. sp., female. 346–348, epigynum. 346, ventral. 347, posterior. 348, lateral. 349, dorsal. 350, abdomen, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Specimens Examined. PERU *Madre de Dios:* Reserva de Manu, Puesta de Vigilancia Pakitza, 11°58'S, 71°18'W, 6 Oct. 1987, 1♀ (D. Silva D., J. Coddington, USNM). BRAZIL *Mato Grosso:* 260 km N Xavantina, 12°49'S, 51°46'W, Feb., Apr. 1969, 1♀ (Xavantina Cachimbo Exped., MCZ). BOLIVIA *Beni:* Est. Biol. Beni, 14°47'S, 66°15'W, ca. 225 m, 8–14 Nov. 1989, 1♀ (J. Coddington, USNM).

Metazygia carimagua new species
Figures 333–336; Map 4C

Holotype. Female holotype and one female paratype from Carimagua, 100 m, Depto. Meta, Colombia, Oct. 1973, grass and bushes along fence (W. Eberhard), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum, legs orange. Dorsum of abdomen white, with an indistinct pair of dusky patches anteriorly (Fig. 336). Venter with white transverse bar of white pigment spots behind epigynum. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.9 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Total length 3.4 mm. Carapace 1.6 mm long, 1.2 wide, 0.7 behind lateral eyes. First femur 1.7 mm, patella and tibia 2.1, metatarsus 1.7, tarsus 0.6. Second patella and tibia 1.6 mm, third 0.9, fourth 1.4.

Diagnosis. The species lacks black pigment, even in the eye region (Fig. 336). The epigynum differs from that of other species by having a pentagonal shape in ventral view (Fig. 333) and a narrow posterior median plate (Fig. 334).

Specimen Examined. COLOMBIA *Meta:* Carimagua, 100 m, 1♀ (W. Eberhard 633, MCZ).

Metazygia loque new species
Figures 337–341; Map 4C

Holotype. Female holotype from Rurrenabaque, Beni, Bolivia, Oct.–Nov. 1956 (L. Peña), in IRSNB. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange-yellow, cephalic region dusky. Chelicerae brown. Labium, endites brown. Sternum dusky orange, borders darkest. Coxae, legs orange-yellow with distal articles darkest. Dorsum of abdomen with dense white pigment spots, anterior with black transverse band (Fig. 340); venter with a pair of white longitudinal bands and a pair of white spots on light gray (Fig. 341). Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.2 diameter apart, 0.9 diameter from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Total length 4.5 mm. Carapace 1.7 mm long, 1.2 wide, 0.7 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.3, metatarsus 1.6, tarsus 0.5. Second patella and tibia 2.0 mm, third 1.1, fourth 1.5.

Diagnosis. The abdomen is oval, widest in middle, and slightly flattened anteriorly (Fig. 340). The female is distinguished by having an epigynum that is flat, ventrally projecting, and longer than wide (Figs. 337–339).

Metazygia cienaga new species
Figures 342–345; Map 4D

Holotype. Female holotype from along Arroyo Frío, La Ciénaga, Prov. La Vega, 19°04'N, 70°51'W, Dominican Republic, 8 Jan. 1986 (S. Larcher), in USNM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, cephalic region black. Chelicerae, labium, endites orange. Sternum orange. Coxae orange, legs dusky orange. Dorsum of abdomen white with two anterior black marks that are fused ventrally above carapace (Fig. 345). Venter white, with large white square between epigynum and spinnerets. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.5 diameters from laterals. Height of clypeus equals 0.3 diameter of anterior median eye. Total length 5.2 mm. Carapace 2.3 mm long, 1.7 wide, 0.9 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.8. Second patella and tibia 2.2 mm, third 1.4, fourth 1.9.

Diagnosis. The abdomen is oval, widest in middle, anteriorly flattened slightly with median protuberance (Fig. 345). The epigynum has a median, wide lobe (Fig. 342) and a triangular, posterior median plate (Fig. 343).

Metazygia souza new species
Figures 346–350; Map 4D

Holotype. Female holotype from Ilha de Maracá, Río Uraricoera, Roraima State, Brazil, 25 Sept. 1987 (M. E. L. Souza), in MCN no. 20059. The specific name is a noun in apposition after the collector.

Description. Female holotype. Carapace yellow, eye region black. Chelicerae dusky yellow. Labium, endites, sternum yellow. Coxae, legs yellow. Dorsum of abdomen with dense white pigment and a black band around the anterior (Fig. 349), sides and venter without pigment (Fig. 350). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.6 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.4 diameter apart, 1.3 diameters from laterals. Height of clypeus equals 0.2 diameter of anterior median eye. Total length 4.0 mm. Carapace 1.5 mm long, 1.2 wide, 0.6 behind lateral eyes. First femur 1.7 mm, patella and tibia 2.1, metatarsus 1.5, tarsus 0.6. Second patella and tibia 1.7 mm, third 1.0, fourth 1.5.

Diagnosis. Unlike that of other species, the epigynum of *M. souza* has a posterior median notch (Figs. 346, 347).

Metazygia lopez new species
Figures 351–359; Map 4D

Holotype. Female holotype and one female and six male paratypes from Hacienda Mozambique, 15 km SW Puerto Lopez, 500 m elev., Depto. Meta, Colombia (W. Eberhard), in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace, sternum, legs yellow; legs with tips of tarsi black. Dorsum of abdomen with white pigment and a dusky band that is broken in middle around anterior (Fig. 355). Venter white behind epigynum, with transverse dark mark in front of spinnerets (Fig. 356). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes a little less than their diameter apart, a little less than their diameter from laterals. Posterior median eyes 0.3 their diameter apart, 1.7 from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.2 mm. Carapace 1.7 mm long, 1.2 wide, 0.6 behind lateral eyes. First femur 1.8 mm, patella and tibia 2.1, metatarsus 1.7, tarsus 0.7. Second patella and tibia 1.7 mm, third 1.0, fourth 1.4.

Male paratype. Coloration as in female. Carapace shiny with indistinct round thoracic depression enclosing a median longitudinal mark. Posterior median eyes 1 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes their diameters apart, 0.5 from laterals. Posterior median eyes almost touching, 1.7 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. First coxae with small hook. Fourth coxae with a pointed tubercle. Abdomen oval, longer than wide. Total length 2.8 mm. Carapace 1.5 mm long, 1.1 wide, 0.5 behind lateral eyes. First femur 1.7 mm, patella and tibia 2.2, metatarsus 1.7, tarsus 0.7. Second patella and tibia 1.6 mm, third 0.9, fourth 1.2.

Note. Males and females have been collected together. The epigynum of some specimens is completely covered by amorphous hard material, probably placed there by the male after mating.

Variation. Total length of females 3.2 to 4.5 mm. Eberhard (personal communication) reports the species to be green when alive. Illustrations were made from the holotype and paratypes.

Diagnosis. The abdomen is spherical (Figs. 355, 356) and, unlike many species, the eye region of the carapace is light in color (Fig. 355) and the posterior median plate of the epigynum is dumbbell-shaped (Fig. 352). The male has a tubercle on the fourth coxa and a complex-shaped conductor (C in Fig. 359) and a long, thorn-shaped embolus (E in Figs. 357–359).

Natural History. Specimens have been collected in grass and brush along a fence in Carimagua, Colombia; in grassland jungle at Puerto Lleras, Colombia; and in savanna, fogging trees, in Venezuela.

Distribution. Venezuela, Amazon region (Map 4D).

Specimens Examined. VENEZUELA *Guárico:* Mato Masaquaral, 45 km S Calabozo, 19 Apr. 1980, 1♀ (K. Rabenold, MCZ). COLOMBIA *Meta:* Carimagua, 100 m, Oct. 1973, 1♀, 1♂ (W. Eberhard, MCZ); Hacienda Mozambique, 15 km SW Puerto Lopez, 11♀, 1♂ (W. Eberhard, MCZ); Lomalinda, Puerto Lleras, 3°18′N, 73°22′W, 12 Jan. 1986, 1♀ (B. T. Carroll, MCZ), Sept. 1987, 2♀ (B. T. Carroll, CAS). PERU *Ucayali:* Laguna Cashibococha, 25 km nr. Pucallpa, 30 Dec. 1987, 1♀ (M. Remo, MUSM). BRAZIL *Amazonas:* Lago do José, Manaus, 9 Aug. 1979, 1♀ (J. Adis, MCN 20057); Ilha de Curari, Manaus, 3 Aug. 1987, 1♀ (J. Adis, MCN 20056); Ilha de Marchantaria, Rio Solimões, 59°58′W, 3°15′S, 2 Sept. 1992, 4♂ (J. Adis *et al.*, INPA).

Metazygia samiria new species

Figures 360–364; Map 4D

Holotype. Female holotype and three female paratypes from Río Samiria, fogging and night collecting, Depto. Loreto, Peru, 8–31 May 1990 (T. Erwin, D. Silva D.), in MUSM, one paratype in MCZ. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace light orange, cephalic region darker, eye area black. Chelicerae brown-black. Labium, endites dusky orange. Sternum orange with sides dusky. Legs orange with indistinct darker dusky rings. Dorsum of abdomen black around anterior, otherwise light (Fig. 363). Venter gray to black with a pair of white patches between epigynum and spinnerets and with white anteriorly on sides of pedicel (Fig. 364). Posterior median eyes 0.9 diameter of anterior medians, laterals 0.9 diameter. Anterior median eyes 0.7 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.4 diameters from laterals. Height of clypeus equals 0.7 diameter of anterior median eye. Total length 5.6 mm. Carapace 2.1 mm long, 1.6 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.7, metatarsus 1.9, tarsus 0.7. Second patella and tibia 2.5 mm, third 1.3, fourth 2.1.

Variation. Total length of females 4.5 to 5.7 mm. Illustrations were made from the female holotype.

Diagnosis. Metazygia samiria differs from *M. ducke* in the shape of the lateral plates in posterior view of the epigynum (Fig. 361).

Distribution. Western Amazon region (Map 4D).

Specimens Examined. PERU *Huánuco:* Dantas–La Molina, SW Puerto Inca, 09°28′S, 75°00′W, 22 May 1987, 1♀ (D. Silva D., MUSM); Cucharas, Huallaga Valley, Feb.–Apr. 1954, 1♀ (F. Woytkowski, CAS). *Madre de Dios:* 15 km E Puerto Maldonado, 12°33′S, 69°03′W, 26 Feb. 1989, 1♀ (D. Silva D., MUSM); Zona Reservada Tambopata, trocha principal, 290 m, 12°50′S, 69°17′W, 6♀ (D. Silva D., MUSM).

Metazygia ducke new species

Figures 365–369; Map 4D

Holotype. Female holotype from Reserva Ducke, Manaus, Est. Amazonas, Brazil, Aug. 1971 (M. E. Galiano), in MACN. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange. Chelicerae brown. Labium,

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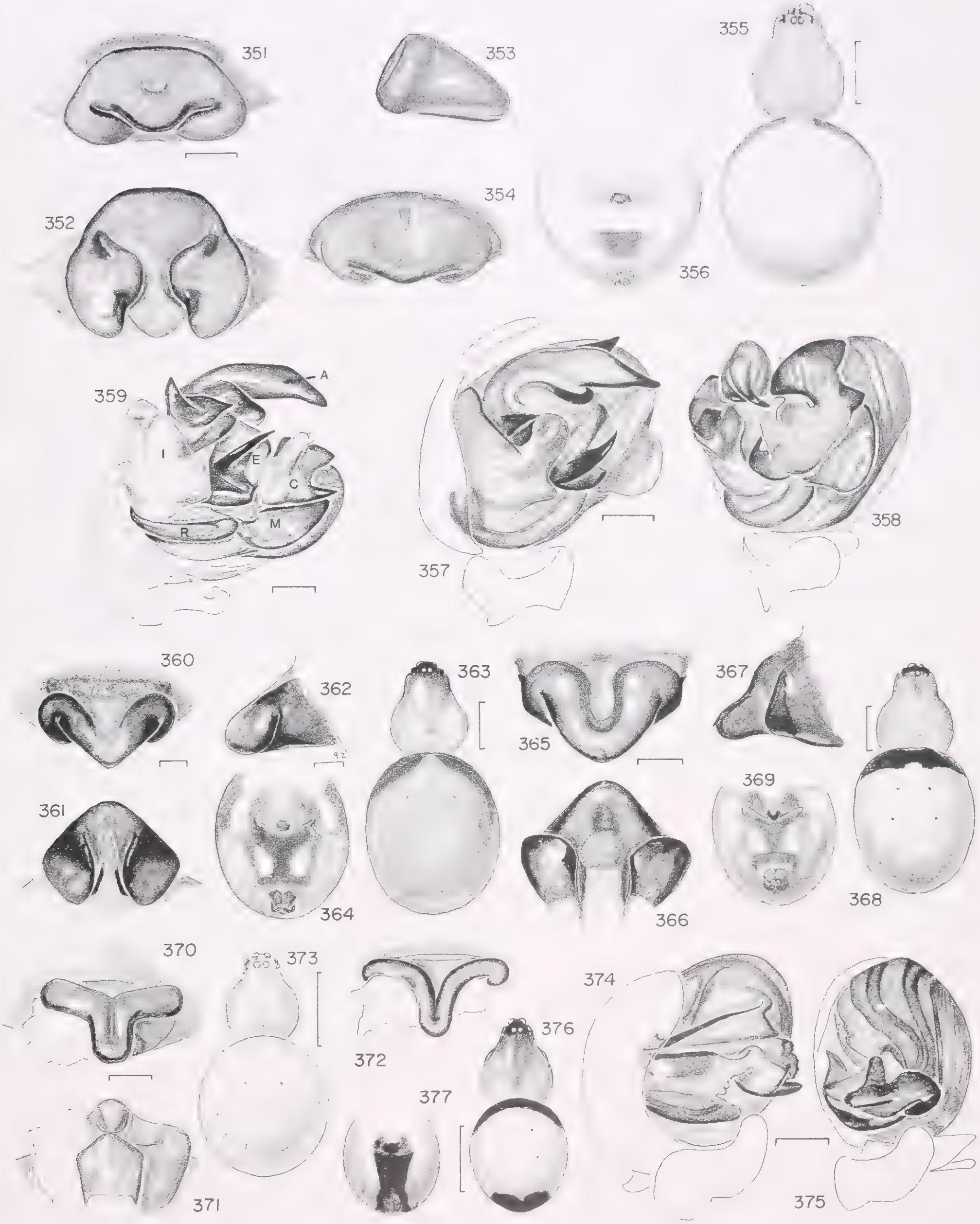
Figures 351–359. *Metazygia lopez* n. sp. 351–356, female. 351–354, epigynum. 351, 354, ventral. 352, posterior. 353, lateral. 351–353, (Colombia). 354. (Brazil). 355, dorsal. 356, abdomen, ventral. 357–359, left male palpus. 357, mesal. 358, ventral. 359, mesal, pulled apart.

Figures 360–364. *M. samiria* n. sp., female. 360–362, epigynum. 360, ventral. 361, posterior. 362, lateral. 363, dorsal. 364, abdomen, ventral.

Figures 365–369. *M. ducke* n. sp., female. 365–367, epigynum. 365, ventral. 366, posterior. 367, lateral. 368, dorsal. 369, abdomen, ventral.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Figures 370–373. *M. erratica* (Keyserling), female. 370–372, epigynum. 370, 372, ventral. 371, posterior. 371, (Mato Grosso). 372, (Holotype). 373, dorsal.

Figures 374–377. *M. manu* n. sp, male. 374, 375, palpus. 374, mesal. 375, ventral. 376, dorsal. 377, abdomen, ventral.

Abbreviations. A, terminal apophysis; C, conductor; E, embolus; I, stipes; M, median apophysis; R, radix.

Scale lines. 1.0 mm, genitalia 0.1 mm.

endites brown. Sternum orange, dusky on each side. Coxae and legs orange with distal articles of legs darker. Dorsum of abdomen with dense white pigment spots and an anterior transverse black band (Fig. 368). Venter with a pair of white patches on gray (Fig. 369). Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.6 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 5.0 mm. Carapace 2.1 mm long, 1.5 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.7, metatarsus 1.8, tarsus 0.6. Second patella and tibia 2.3 mm, third 1.2, fourth 1.9.

Variation. The specimen from Bolivia has a black sternum and other minor differences.

Diagnosis. Metazygia ducke differs from *M. samiria* (Fig. 361) by the shape of the lateral plates in posterior view of the epigynum and the square median plate, which has a textured area at its ventral end (Fig. 366).

Distribution. Amazon region (Map 4D).

Specimens Examined. BOLIVIA *Beni:* Est. Biol. Beni, 14°47′S, 66°15′W, 225 m, 8–14 Nov. 1989, 1♀ (J. Coddington *et al.*, USNM).

Metazygia erratica (Keyserling), new combination

Figures 370–373; Map 4E

Epeira erratica Keyserling, 1883: 197, pl. 15, fig. 3, ♀. Female holotype from "Provinz Amazonas," Brazil, in HECO, examined. Keyserling, 1892: 161, pl. 8, fig. 119, ♀.

Aranea errans Roewer, 1942: 841. New name for *erratica*, since thought preoccupied by *Aranea erratica* Olivier, 1789.

Araneus erraticus:—Bonnet, 1955: 501.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum, coxae, legs light orange. Abdomen whitish (Fig. 373). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.7 from laterals. Posterior median eyes 0.6 diameter apart, 1.4 diameters from laterals. Height of clypeus 0.5 diameter of anterior median eye. Legs without macrosetae. Total length 2.9 mm. Carapace 1.4 mm long, 0.9 wide, 0.6 behind lateral eyes. First femur 1.5 mm, patella and tibia 1.7, metatarsus 1.2, tarsus 0.6. Second patella and tibia 1.3 mm, third 0.7, fourth 1.1.

Variation. Keyserling records a silvery coloration of the abdomen; the specimens available have lost all pigment. Total length 2.9 to 3.9 mm. Figure 372 was made from the holotype; Figures 370, 371, and 373 are from a specimen from Mato Grosso.

Diagnosis. The absence of black in the eye region (Fig. 373) and the thick folded lips of the epigynum in ventral view (Figs. 370, 372) separate *M. erratica* from *M. samiria* and similar species. All specimens had black amorphous material covering the openings of the epigynum (on the left of Figs. 370–372) which was not found in related species.

Specimens Examined. BRAZIL *Mato Grosso:* Barra do Tapirapé, 1–5 Jan. 1961, 1♀ (B. Malkin, AMNH); Utiariti, 25 Oct. 1966, 1♀ (F. Lenko, Pereira, MZSP 6064).

Metazygia manu new species

Figures 374–377; Map 4E

Holotype. Male holotype from Puesto de Vigilancia Pakitza, Zona Reservada de Manu, Depto. Madre de Dios, 11°58′S, 71°18′W, Peru, night collecting, 30 Sept. 1987 (D. Silva D., J. Coddington), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace orange, cephalic area gray, black between eyes. Chelicerae, labium, endites black. Sternum black. Coxae light orange; legs orange except for black ring distally on first tibia. Dorsum of abdomen white with anterior transverse black band, and posterior pair of black patches that fuse to a median band above spinnerets (Fig. 376). Venter with distinct black band covering both genital area and spinnerets and continuing into dorsal black patches (Fig. 377).

Carapace with double border above first coxae. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.3 diameter apart, their diameter from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Second tibia thicker than first, with a macroseta on swollen area. Total length 2.7 mm. Carapace 1.24 mm long, 1.04 wide, 0.54 behind lateral eyes. First femur 1.03 mm, patella and tibia 1.18, metatarsus 0.75, tarsus 0.38. Second patella and tibia 1.14 mm, third 0.81, fourth 1.12.

Diagnosis. The male palpus differs from others by having a long, fine, "diagonal," embolus (Fig. 374) and by the complex shape of the median apophysis (at 4 hr in Fig. 374, below center of Fig. 375).

Metazygia genaro new species
Figures 378–384; Map 4E

Holotype. Female holotype from Genaro Herrera, 04°55′S, 73°45′W, Depto. Loreto, Peru, 26 Aug. 1988 (D. Silva D.), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace light orange, cephalic region brown, eye area black. Chelicerae dark brown. Labium, endites, sternum brown. Coxae orange; first two legs dark brown, last two orange. Dorsum of abdomen white with a black band around anterior (Fig. 381); venter with a pair of white patches (Fig. 382). Posterior median eyes same diameter as anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.4 diameter apart, 1.1 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.3 mm. Carapace 1.7 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.1, metatarsus 1.5, tarsus 0.5. Second patella and tibia 1.8 mm, third 1.1, fourth 1.6.

Male. As in female, but orange areas more yellowish (Fig. 384); venter with a pair of white pigment patches on gray (Fig. 382). Carapace with lobes above first coxae (Fig. 384). Posterior median eyes same diameter as anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.3 diameter apart, 0.8 diameter from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.4 diameter of anterior median eye. First coxa with hook, third and fourth each with macroseta on a soft tubercle. Second tibia thicker than first with macrosetae, one of them long. Total length 2.5 mm. Carapace 1.30 mm long, 1.04 wide, 0.48 behind lateral eyes. First femur 1.49 mm, patella and tibia 1.91, metatarsus 1.40, tarsus 0.52. Second patella and tibia 1.31 mm, third 0.80, fourth 1.14.

Note. Male and female were matched because in both the anterior dorsal bands of the abdomen are intense black, with white adjacent to the black both anteriorly and posteriorly. Both sexes have a pair of white patches on black on the underside of the abdomen (Fig. 382). Male and female did not come from the same locality.

Diagnosis. A broad, triangular epigynal scape as seen in ventral view (Fig. 378) distinguishes the female. Males are distinguished from *M. voxanta* by the shape of the palpal sclerites (Fig. 383).

Distribution. Depto. Loreto, Peru (Map 4E).

Specimen Examined. PERU *Loreto:* Río Manatee [a tributary of the Amazon between Explorers Lodge and Río Napo], 18 July 1989, grass and shrubs, 1♂ (G. B. Edwards, FSCA).

Metazygia voxanta new species
Figures 385–390; Map 4E

Holotype. Female holotype, female paratype, and two male paratypes from 260 km N Xavantina, 12°49′S, 51°46′W, 400 m, Mato Grosso State, Brazil, campo-grassland, Feb.–Apr. 1969 (Xavantina–Cachimbo Expedition), 1♀ holotype and 1♂ paratype in MCN, others in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, eye region black. Chelicerae, labium, endites brownish. Sternum orange. Coxae, legs orange. Dorsum of abdomen white, with anterior and posterior black marks (Fig. 388). Venter dusky with few irregularly spaced white pigment spots. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Total length 2.5 mm. Carapace 0.9 mm long, 0.7 wide, 0.4 behind lateral eyes. First femur 0.8 mm, patella and tibia 1.0, metatarsus 0.6, tarsus 0.4. Second patella and tibia 0.9 mm, third 0.5, fourth 0.7.

Male paratype. Color as in female. The carapace has a lobe above the first coxa (Fig. 390). Posterior median eyes 0.7 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.3 diameter apart, 0.2 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. First coxa with hook, fourth with one short macroseta. Second tibia thicker than first, with four macrosetae on distal half. Total length 2.0 mm. Carapace 1.0 mm long, 0.8 wide, 0.4 behind lateral eyes. First femur 0.8 mm, patella and tibia 1.1, metatarsus 0.6, tarsus 0.4. Second patella and tibia 0.9 mm, third 0.5, fourth lost.

Note. Males and females were collected together.

Diagnosis. The epigynum has two lobes in ventral view (Fig. 385) and an hourglass-shaped median plate in posterior view (Fig. 386). The male is similar to that of *M. genaro* but has an embolus lamella and a median apophysis of different shape (Fig. 389).

Metazygia peckorum new species
Figures 391–400; Map 4F

Holotype. Female from La Chiquita, 5 m elev., 11 km SE San Lorenzo, Esmeraldes Prov., Ecuador, 3–10 June 1975 (S. and J. Peck), in MCZ. The species is named after the collectors.

Description. Female holotype. Carapace light orange, cephalic region dusky. Chelicerae, labium, endites brown. Sternum black. Coxae light orange. First two pairs of legs brown, except for proximal end of femora light orange, last two pairs of legs light orange. Dorsum of abdomen white with anterior dark band (Fig. 399). Venter black with a pair of white patches (Fig. 400). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.1 diameters from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. Total length 4.6 mm. Carapace 1.9 mm long, 1.5 wide, 0.8 behind lateral eyes. First femur 2.0 mm, patella and tibia 2.3, metatarsus 1.7, tarsus 0.6. Second patella and tibia 2.0 mm, third 1.2, fourth 1.8.

Variation. Total length of females 4.0 to 5.1 mm.

Diagnosis. The oval to triangular median area of the epigynum has a longitudinal groove and a minute flat scape at its tip (Figs. 391, 394, 397), and the posterior median plate is constricted dorsally in pos-

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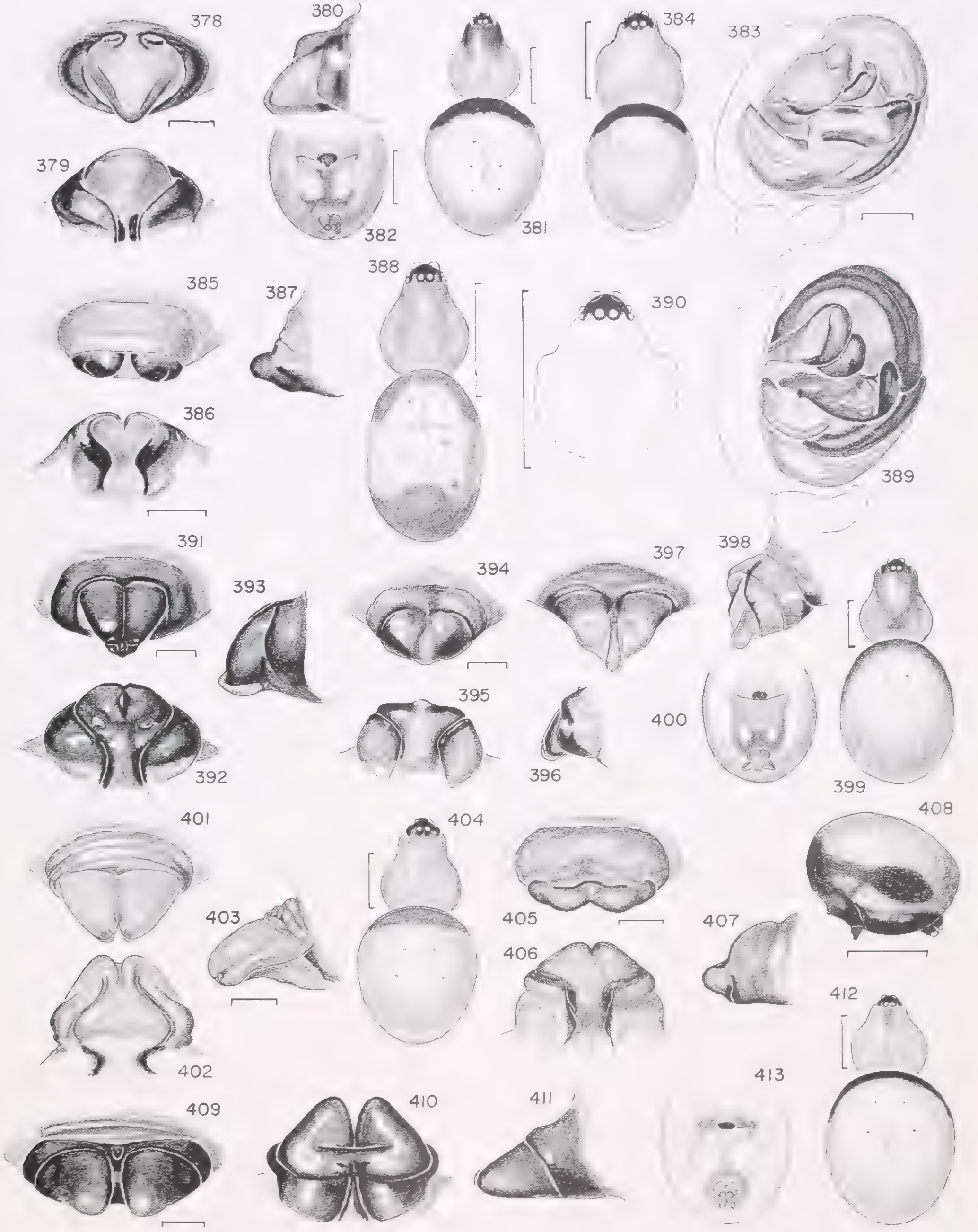
Figures 378–384. *Metazygia genaro* n. sp. 378–382, female. 378–380, epigynum. 378, ventral. 379, posterior. 380, lateral. 381, dorsal. 382, abdomen, ventral. 383, 384, male. 383, left palpus. 384, dorsal.

Figures 385–390. *M. voxanta* n. sp. 385–388, female. 385–387, epigynum. 385, ventral. 386, posterior. 387, lateral. 388, dorsal. 389, 390, male. 389, palpus. 390, carapace.

Figures 391–400. *M. peckorum* n. sp., female. 391–398, epigynum. 391, 394, 397, ventral. 392, 395, posterior. 393, 396, 398, lateral. 391–393, (Peru) 394 396, (holotype, Ecuador). 397, 398 (Pará, Brazil). 399, dorsal. 400, abdomen, ventral.

Figures 401–404. *M. moldira* n. sp., female. 401–403, epigynum. 401, ventral. 402, posterior. 403, lateral. 404, dorsal.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Figures 405–408. *M. valentim* n. sp., female. 405–407, epigynum. 405, ventral. 406, posterior. 407, lateral. 408, abdomen, lateral.

Figures 409–413. *M. bahia* n. sp., female. 409–411, epigynum. 409, ventral. 410, posterior. 411, lateral. 412, dorsal. 413, abdomen, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

terior view (Figs. 392–395): these characters separate *M. peckorum* from *M. moldira* (Figs. 401, 402).

Distribution. From Colombia to Bahia State, Brazil (Map 4F).

Specimens Examined. COLOMBIA *Valle:* Central Hidroelectrica Anchicayá, 1978, 1♀ (W. Eberhard, MCZ). ECUADOR *Los Ríos:* Juan Montalvo, Mar. 1938, 1♀ (W. Clarke-Macintyre, AMNH). PERU *Huánuco:* Monzón Valley, Tingo María, 10 Nov. 1954, 1♀ (E. I. Schlinger, E. S. Ross, CAS). BRAZIL *Roraima:* Ilha de Maracá, Río Uraricoera, 22 July 1987, 1♀ (A. A. Lise, MCN 20061). *Pará:* Belém, Aug. 1971, 1♀ (M. E. Galiano, MEG). *Bahia:* Camacã, Fazenda Matiapã, 16 Oct. 1978, 1♀ (J. S. Santos, MCN 11117); Uruçuca, Fazenda Almada, 26 Nov. 1977. 1♀ (J. S. Santos, MCN 10321).

Metazygia moldira new species
Figures 401–404; Map 4F

Holotype. Female holotype from 15 km E Puerto Maldonado, 12°33′S, 69°03′W, 200 m, Depto. Madre de Dios, Peru, 26 Feb. 1989 (D. Silva D.), in MUSM. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace orange, eye region black. Chelicerae orange with a proximal dusky patch. Labium, endites dusky orange. Sternum light orange. Legs light orange. Dorsum of abdomen white with a black band around anterior (Fig. 404). Venter with a white square between epigynum and spinnerets. Eyes subequal in size. Anterior median eyes their diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.5 diameter apart, 1.2 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 3.8 mm. Carapace 1.9 mm long, 1.4 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.5, metatarsus 1.8, tarsus 0.7. Second patella and tibia 2.3 mm, third 1.3, fourth 1.8.

Variation. Total length of females 3.8 to 5.6 mm. Illustrations were made from the female holotype.

Diagnosis. Metazygia moldira is similar to *M. peckorum,* but the posterior median plate of the epigynum is flask-shaped and widest dorsally (bottom of Fig. 402).

Distribution. Western Amazon region (Map 4F).

Specimens Examined. ECUADOR *Sucumbíos:* bridge over Río Cuyabeno, 0.01°S, 76°18′W, 8, 9 Aug. 1988, 1♀ (W. Maddison, MCZ). PERU *Loreto:* Río Samiria, 8–31 May 1990, 1♀ (T. Erwin, D. Silva D., MUSM).

Metazygia valentim new species
Figures 405–408; Map 4F

Holotype. Female holotype and two immatures from São Valentim, Est. Rio Grande do Sul, Brazil, 16 Oct. 1976 (R. Scherer), in MCN no. 04782. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace dusky brown, eye region black. Chelicerae, labium, endites dark brown. Sternum dark brown. Coxae light yellowish; legs light yellowish with tips of tarsi darker. Dorsum of abdomen white with anterior transverse black band; sides with a black patch (Fig. 408). Venter with a black band starting anteriorly from the transverse band and posteriorly enclosing spinnerets. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.6 diameters from laterals. Laterals 0.5 their diameter apart. Height of clypeus equals 0.8 diameter of anterior median eye. Total length 3.1 mm. Carapace 1.4 mm long, 1.1 wide, 0.6 behind lateral eyes. First femur 1.6 mm, patella and tibia 1.9, metatarsus 1.2, tarsus 0.5. Second patella and tibia 1.6 mm, third 0.8, fourth 1.3.

Diagnosis. The epigynum of this species differs from that of other species by having a transverse posterior lip in ventral view (Fig. 405) and a T-shaped posterior median plate in posterior view (Fig. 406).

Metazygia bahia new species
Figures 409–413; Map 4F

Holotype. Female holotype from Fazenda Jacarandá, Itamarajú, Bahia State, Brazil, 9 Dec. 1977 (J. S. Santos), in MCN no. 11030. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, eye region black. Chelicerae brown. Labium, endites dusky orange. Sternum dusky orange. Legs orange. Dorsum of abdomen with dense white pigment spots and with a black band around anterior (Fig. 412). Venter with indistinct pair of white patches, dusky around spinnerets (Fig. 413). Posterior median eyes 0.9 diameter of anterior medians, anterior laterals 0.7 diameter, posterior 0.8. Anterior median eyes 0.4 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.4 diameter apart, one diameter from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Total length 4.2 mm. Carapace 2.0 mm long, 1.4 wide, 0.8 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.3, metatarsus 1.6, tarsus 0.6. Second patella and tibia 2.0 mm, third 1.2, fourth 1.6.

Variation. Total length of females 4.0 to 4.3 mm. Illustrations were made from the holotype.

Diagnosis. Unlike the epigynum of *M. peckorum* (Figs. 391, 392), the two cones on the epigynum of *M. bahia* are medially separated (Figs. 409, 410).

Distribution. Bahia State to São Paulo State, Brazil (Map 4F).

Specimens Examined. BRAZIL *São Paulo:* Alto da Serra Barreira das Camellas, Nov. 1941, 1♀ (J. Domigo, MZSP 9641); Caraguatatuba, 14 July 1964, 1♀ (Exped. Depto. Zool., MZSP).

Metazygia rothi new species
Figures 414, 415; Map 4F

Holotype. Male holotype from Lomalinda, nr. Puerto Lleras, Depto. Meta, 300 m, 3°18′S, 73°22′W, Colombia, Mar. 1988 (V. Roth), in MCZ. The species is named after the collector.

Description. Male holotype. Carapace olive-white, black between eyes. Chelicerae, labium, endites, sternum, legs olive-white. Dorsum of abdomen white with black band around anterior (Fig. 415). Venter dusky with an indistinct pair of white patches. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.5 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 diameter from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. Second tibia barely thicker than first, without macrosetae. Total length 2.1 mm. Carapace 1.04 mm long, 0.78 wide, 0.41 behind lateral eyes. First femur 0.96 mm, patella and tibia 1.18, metatarsus 0.78, tarsus 0.37. Second patella and tibia 0.94 mm, third 0.58, fourth 0.78.

Note. This delicate, small male might be that of *M. carimagua.* A recent molt may have given the specimen its olive-white color.

Diagnosis. Metazygia rothi differs from others by having the sickle-shaped embolus positioned on the conductor and by the shape of the median apophysis and conductor (Fig. 414).

Metazygia cazeaca new species
Figures 416, 417; Map 4I

Holotype. Male holotype from Jacareacanga, Est. Pará, Brazil, Oct. 1959 (M. Alvarenga), in AMNH. The specific name is an arbitrary combination of letters.

Description. Male holotype. Carapace dark brown, except for light orange median thoracic region. Chelicerae orange. Labium, endites dusky orange. Sternum orange. Coxae light orange, legs orange. Dorsum of abdomen black with a transverse light band (Fig. 417), sides light. Venter with black trapezoid between genital groove and spinnerets. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.5 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.3 diameter apart, their diameter from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Endite without tooth. First coxa with minute hook. (Distal leg articles broken off.) Total length 2.1 mm. Carapace 1.1 mm long, 0.9 wide, 0.5 behind lateral eyes. Third patella and tibia 0.7 mm.

Diagnosis. The coloration of the body, the elongate shape of the abdomen, widest in posterior half (Fig. 417), and the shape of the sclerites of the palpus (Fig. 416) are unlike any other species of *Metazygia*. This species may not belong to the genus.

Metazygia cunha new species
Figures 418, 419; Map 4H

Holotype. Male holotype from Jaboticabal, São Paulo State, Brazil, 4 Oct. 1986 (H. F. do Cunha), in MCN no. 17820. The specific name is a noun in apposition after the name of the collector.

Description. Male holotype. Carapace yellow, eye region black. Chelicerae, labium, endites yellow. Sternum yellow. Legs yellow. Dorsum of abdomen white, with a band around the anterior and an indistinct, transverse, white patch adjacent and posterior to it (Fig. 419). Venter with a pair of white patches on light gray, with another posterior pair of white spots. Carapace with small lobes (Fig. 419). Median eyes large. Posterior median eyes same diameter as anterior medians, laterals 0.6 diameter. Anterior median eyes 0.4 diameter apart, 0.2 diameter from laterals. Posterior median 0.2 diameter apart, 0.8 diameter from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. First coxa with large hook, third and fourth with a macroseta; the macroseta on the fourth coxa on a tubercle. Total length 3.0 mm. Carapace 1.4 mm long, 1.0 wide, behind lateral eyes 0.5 wide. First femur 1.7 mm, patella and tibia 2.2, metatarsus 1.7, tarsus 0.6. Second patella and tibia 1.5 mm, third 0.9, fourth 1.3.

Diagnosis. *Metazygia cunha* differs from others by the shape of the embolus lamella, conductor, and median apophysis (Fig. 418).

Metazygia aldela new species
Figures 420–422; Map 4I

Holotype. Male holotype from Adeia Araçu, Igarapé Gurupi-Uma, 50 km E of Canindé, Rio Gurupi, Est. Pará, Brazil, 2–30 May 1963 (B. Malkin), in AMNH. The specific name is an arbitrary combination of letters.

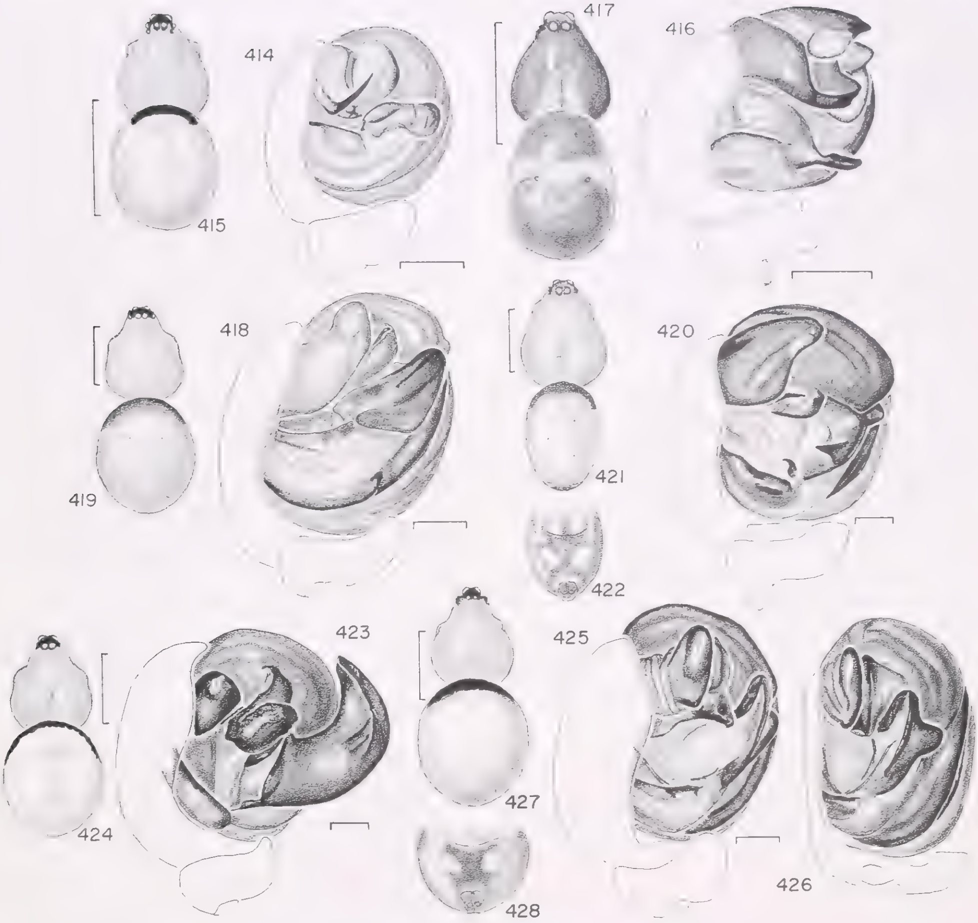
Description. Male holotype. Carapace orange. Chelicerae dusky orange. Labium, endites dusky orange. Sternum light orange with black on each side. Legs orange. Dorsum of abdomen whitish with transverse black band around anterior (Fig. 421); venter black, with a pair of round pigmentless patches side by side (Fig. 422). Posterior median eyes same diameter as anterior medians, laterals 0.6 diameter. Anterior median eyes 0.6 diameter apart, 0.5 diameter from laterals. Posterior median eyes 0.3 diameter apart, their diameter from laterals. Height of clypeus equals 0.6 diameter of anterior median eye. Carapace with small lobes (Fig. 421). First coxa with large hook. Total length 3.5 mm. Carapace 1.8 mm long, 1.5 wide, 0.6 behind lateral eyes. First femur 2.0 mm, patella and tibia 2.5, metatarsus 1.8, tarsus 0.6. Second patella and tibia 1.9 mm, third 1.1, fourth 1.7.

Diagnosis. *Metazygia aldela* differs from others by the large sclerotized embolus lamella (at 11 hr) and the pointed tooth (at 4 hr) on the median apophysis (Fig. 420).

Metazygia atama new species
Figures 423, 424; Map 4H

Holotype. Male holotype from Fazenda Matiapã, Camacã, Bahia State, Brazil, 14 Oct. 1978 (J. S. Santos), in MCN no. 11078. The specific name is an arbitrary combination of letters.

Description. Male holotype. Carapace light orange, eye region black. Chelicerae, labium, endites brown. Sternum brown. Coxae light orange, legs light orange. Dorsum of abdomen white with black band around anterior (Fig. 424); venter black. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.7 diameter apart, 0.3 diameter from laterals. Posterior median eyes 0.2 diameter apart, 1 from laterals. Height of clypeus equals 0.8 diameter of anterior median eye. Carapace with small lobes (Fig. 424). First coxa with large hook, third with one long macroseta and several smaller ones, fourth with one macroseta. Second tibia thicker than first, swollen in middle with two long macrosetae and some others. Total length 2.9 mm. Carapace 1.6



Figures 414, 415. *Metazygia rothi* n. sp., male. 414, left palpus. 415, dorsal.

Figures 416, 417. *M. cazeaca* n. sp., male. 416, palpus. 417, dorsal.

Figures 418, 419. *M. cunha* n. sp., male. 418, palpus. 419, dorsal.

Figures 420–422. *M. aldela* n. sp., male. 420, palpus. 421, dorsal. 422, abdomen, ventral.

Figures 423, 424. *M. atama* n. sp., male. 423, palpus. 424, dorsal.

Figures 425–428. *M. oro* n. sp., male. 425, 426, palpus. 425, mesal. 426, ventral. 427, dorsal. 428, abdomen, ventral.

Scale lines. 1.0 mm, genitalia 0.1 mm.

mm long, 1.3 wide, 0.6 behind lateral eyes. First femur 1.7 mm, patella and tibia 2.3, metatarsus 1.7, tarsus 0.6. Second patella and tibia 1.6 mm, third 1.0, fourth 1.5.

Diagnosis. The palpus of *Metazygia atama* differs from that of other males by the large median apophysis that faces the cymbium (Fig. 423).

Metazygia oro new species
Figures 425–428; Map 4I

Holotype. Male holotype from Río Colorado, El Oro Prov., Ecuador, 4 Nov. 1942 (R. Walls), in CAS. The specific name is a noun in apposition after the type locality.

Description. Male holotype. Carapace dusky orange. Chelicerae orange. Labium, endites, sternum brown. Legs orange. Abdomen white with a black band around anterior (Fig. 427). Venter black with a pair of white patches (Fig. 428). Carapace with small lobes (Fig. 427). Posterior median eyes same diameter as anterior medians, laterals 0.6 diameter. Carapace with small lobes (Fig. 427). Anterior median eyes 0.8 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.3 diameter apart, 1.1 diameters from laterals. Height of clypeus equals 1 diameter of anterior median eye. First coxa with large hook, fourth with a short macroseta. Total length 3.1 mm. Carapace 1.5 mm long, 1.2 wide, 0.6 behind lateral eyes. First femur 1.6 mm, patella and tibia 2.1, metatarsus 1.4, tarsus 0.5. Second patella and tibia 1.5 mm, third 0.9, fourth 1.4.

Diagnosis. This species is distinguished by the unique shape of the embolus lamella and the median apophysis of the palpus (above center and at 3 hr, respectively, in Fig. 425, at 10 hr and center in Fig. 426).

LITERATURE CITED

BANKS, N. 1898. Arachnida from Baja California and other parts of Mexico. Proceedings of the California Academy of Sciences, 3 ser., **1:** 205–308.

———. 1903. A list of Arachnida from Hayti with descriptions of new species. Proceedings of the Academy of Natural Sciences of Philadelphia, **55:** 339–345.

———. 1929. Spiders from Panama. Bulletin of the Museum of Comparative Zoology, **69:** 53–96.

BONNET, P. 1955. Bibliographia Araneorum. Toulouse, **2**(1): 1–918.

———. 1957. Bibliographia Araneorum. Toulouse, **2**(3): 1927–3026.

———. 1959. Bibliographia Araneorum. Toulouse, **2**(5): 4231–5058.

BRIGNOLI, P. 1983. A Catalogue of the Araneae Described Between 1940 and 1981. Manchester: Manchester Univ. Press. 755 pp.

BRYANT, E. B. 1940. Cuban spiders in the Museum of Comparative Zoology. Bulletin of the Museum of Comparative Zoology, **86:** 247–554.

———. 1945. The Argiopidae of Hispaniola. Bulletin of the Museum of Comparative Zoology, **95:** 357–418.

BUSKIRK, R. 1986. Orb-weaving spiders in aggregations modify individual web structure. The Journal of Arachnology, **14:** 259–266.

CAMBRIDGE, F. P.- 1897–1905. Arachnida, Araneidea and Opiliones. **2:** 1–610. *In* Biologia Centrali-Americana, Zoologia, London.

CAMBRIDGE, O. P.-. 1889–1902. Arachnida, Araneidea. **1:** 1–317. *In* Biologia Centrali-Americana, Zoologia, London.

CAPORIACCO, L. DI. 1947. Diagnosi preliminari di specie nuove di Aracnidi della Guiana Brittanica. Monitores Zoologico Italiano, **56:** 20–34.

———. 1948. Arachnida of British Guiana collected by Prof. Beccari. Proceedings of the Zoological Society of London, **118:** 607–747.

CASTILLO, J. A., AND W. EBERHARD. 1983. Use of artificial webs to determine prey available to orb-weaving spiders. Ecology, **64:** 1655–1658.

CHAMBERLIN, R. V. 1925. Diagnoses of new American Arachnida. Bulletin of the Museum of Comparative Zoology, **67:** 211–248.

CLERCK, C. 1758 [1757]. Aranei Svecici. Stockholm, pp. 1–154.

COMSTOCK, J. H. 1912. The Spider Book. Garden City, New York: Doubleday, Doran and Co. 721 pp.

———. 1940. The Spider Book (rev. W. J. Gertsch). Garden City, New York: Doubleday, Doran and Co. 929 pp.

HARROD, J. C., H. W. LEVI, AND L. B. LEIBENSPERGER. 1991. The Neotropical orb weavers of the genus *Larinia* (Araneae: Araneidae). Psyche, **97:** 241–265.

HINGSTON, R. W. G. 1932. A Naturalist in the Guiana Forest. London: E. Arnold & Co. 384 pp.

INTERNATIONAL CODE OF ZOOLOGICAL NOMENCLATURE. 1985. London: British Museum (Natural History). 338 pp.

KASTON, B. J. 1948. Spiders of Connecticut. State Geological and Natural History Survey of Connecticut, **70:** 1–874.

KEYSERLING, E. 1864. Beschreibung neuer und wenig bekannter Arten aus der Familie Orbitelae Latrl. oder Epeiridae Sund. Sitzungs-Berichte der naturwissenschaftlichen Gesellschaft Isis, Dresden, **1863:** 63–98, 119–154.

———. 1878. Spinnen aus Uruguay und einigen anderen Gegenden Amerikas. Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, **27:** 571–624.

———. 1883. Neue Spinnen aus Amerika. Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, **32:** 195–226.

———. 1892–93. Die Spinnen Amerikas, Epeiridae. Nürnberg, **4:** 1–377.

KRAUS, O. 1955. Spinnen aus El Salvador (Arachnoidea, Araneae). Abhandlungen von der senckenbergischen naturforschenden Gesellschaft, **493:** 1–112.

LEVI, H. W. 1971. The *Ravilla* group of the orbweaver genus *Eriophora* in North America. (Araneae: Araneidae). Psyche, **77**(3): 280–302 (for 1970).

———. 1972. The orb-weaver genera *Singa* and

Hypsosinga in America (Araneae: Araneidae). Psyche, **78:** 229–256.

———. 1974. The orb-weaver genus *Zygiella*. Bulletin of the Museum of Comparative Zoology, **146:** 267–290.

———. 1975. The American orb-weaver genera *Larinia, Cercidia* and *Mangora* north of Mexico (Araneae, Araneidae). Bulletin of the Museum of Comparative Zoology, **147:** 101–135.

———. 1976. The orb-weaver genera *Verrucosa, Acanthepeira, Wagneriana, Acacesia, Wixia, Scoloderus,* and *Alpaida* North of Mexico. (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **147:** 351–391.

———. 1977. The American orb-weaver genera *Cyclosa, Metazygia* and *Eustala* North of Mexico (Araneae, Araneidae). Bulletin of the Museum of Comparative Zoology, **148:** 61–127.

———. 1985. The spiny orb-weaver genera *Micrathena* and *Chaetacis* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **150:** 429–618.

———. 1986. The Neotropical orb-weaver genera *Chrysometa* and *Homalometa* (Araneae: Tetragnathidae). Bulletin of the Museum of Comparative Zoology, **151:** 91–215.

———. 1988. The Neotropical orb-weaving spiders of the genus *Alpaida* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **151:** 365–487.

———. 1989. Experiments with spider preservatives. American Arachnology, **39:** 6.

———. 1991a. The Neotropical and Mexican species of the orb-weaver genera *Araneus, Dubiepeira* and *Aculepeira* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **152:** 167–315.

———. 1991b. The Neotropical orb-weaver genera *Edricus* and *Wagneriana* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **152:** 363–415.

———. 1992. Spiders of the orb-weaver genus *Parawixia* in America (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **153:** 1–46.

———. 1993a. American *Neoscona* and corrections to previous revisions of Neotropical orb-weavers (Araneae: Araneidae). Psyche, **99:** 221–239.

———. 1993b. The Neotropical orb-weaving spiders of the genera *Wixia, Pozonia* and *Ocrepeira* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **153:**47–141.

LUBIN, Y. 1978. Seasonal abundance and diversity of web-building spiders in relation to habitat structure on Barro Colorado Island, Panama. Journal of Arachnology, **6:** 31–51.

MCCOOK, H. C. 1894. American Spiders and Their Spinningwork, Vol. 3. Self-published, Academy of Natural Sciences of Philadelphia, pp. 1–285.

MELLO-LEITÃO, C. F. DE. 1941. Las arañas de Córdoba, La Rioja, Catamarca, Tucuman, Salta y Jujuy collectadas por los Profesores Birabén. Revista del Museo de La Plata (Nueva Serie) Zoología, **2:** 99–198.

OLIVIER, G. A. 1789. Araignée, Aranea. Encyclopédie méthodique. Histoire Naturelle Insectes, Paris, **4:** 173–240.

PETRUNKEVITCH, A. 1911. A synonymic index-catalogue of spiders of North, Central and South America with all adjacent islands, Greenland, Bermuda, West Indies, Terra del Fuego, Galapagos, etc. Bulletin of the American Museum of Natural History, **29:** 1–791.

———. 1930. The spiders of Porto Rico. Transactions of the Connecticut Academy of Arts and Sciences, **30:** 1–355.

ROEWER, C. F. 1942. Katalog der Araneae von 1758 bis 1940. Bremen, **1**: 1–1040.

———. 1955. Katalog der Araneae. Institute royal des sciences naturelle de Belgique, Brussels, **2b:** 927–1751.

SIMON, E. 1895. Histoire Naturelle des Araignées. Paris, **1:** 761–1084.

———. 1905. Etude sur les Arachnides recueillis en Patagonie par le Dr Filippo Silvestri. Bollettino dei Musei di zoologia e di anatomia comparata della R. Università di Torino, **20:** 1–17.

STRAND, E. 1915. Systematisch-faunistische Studien über paläarktische, afrikanische und amerikanische Spinnen des senckenbergischen Museums. Archiv für Naturgeschichte, **81:** 1–153.

VALLE, C., AND M. T. VALLE. 1972. Algumas observações sôbre Biologia de *Metazygia unquiformis*. Revista Brasileira de Biologia, **32:** 33–40.

VAURIE, C. AND P. 1949. Insect collecting in Guatemala 65 years after Champion. Journal of the New York Entomological Society, **57:** 1–18.

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Orb-Weaving Spiders *Actinosoma, Spilasma, Micrepeira, Pronous,* and Four New Genera (Araneae: Araneidae)

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ORB-WEAVING SPIDERS *ACTINOSOMA, SPILASMA, MICREPEIRA, PRONOUS,* AND FOUR NEW GENERA (ARANEAE: ARANEIDAE)

HERBERT W. LEVI[1]

ABSTRACT. *Actinosoma* contains one species, *A. pentacanthum*. *Spilasma* has three species, two of which are new. *Micrepeira* has seven species, of which five are new. *Pronous* has 14 species, of which 11 are new. The new genera are *Spinepeira,* with one new species known only from a female; *Hingstepeira,* with four species, three of them new; *Madrepeira,* with one new species; and *Tatepeira,* with four species, three of which are new and of doubtful generic placement. There is one new generic synonymy and 11 new synonymies of species names. Species of all these genera are known only from the Americas.

The species of several of these genera make unusual webs. *Actinosoma pentacanthum* lives over water on emergent vegetation. *Hingstepeira, Spilasma,* and *Micrepeira* build retreats into the web. *Madrepeira* makes a ladderweb. Most of these spiders are rarely collected. The names used by R. W. G. Hingston in his observations on unusual webs are identified.

INTRODUCTION

This is one of a series of papers revising Neotropical araneid orb weavers. Previous papers are listed in Levi (1993a). Since 1993, revisions of *Lewisepeira* Levi (1993b), *Kaira* O. P.-Cambridge (Levi, 1993c), and *Acacesia* Simon (Glueck, 1994) have been published.

This paper is dedicated to those collectors who contributed specimens with photographs of their webs. They are W. Eberhard, J. Coddington, H. Höfer, and R. L. C. Baptista. Without their photographs and notes on web structure, this revision would lack important data. The photographs made it possible to place many of the species named by Hingston (1932) in his book on Guyana spiders. Hingston did not intend to describe new species and did so only because no keys were available and nobody could name the spiders whose unusual webs he had observed and illustrated. (See Note, p. 209.)

Among the species described here are many that probably are quite common but are rarely collected. *Actinosoma* occurs on emergent vegetation and is known to dive and run over water if disturbed. Spider collectors are usually not equipped with waders or boats, and the knowledge that schistosomiasis occurs in areas in the Lesser Antilles, northern Venezuela, coastal Surinam, and eastern Brazil (IAMAT, 1992) further deters arachnologists from splashing in ponds.

Pronous may be equally difficult to collect. More than half of the available specimens were picked up by A. M. Chickering. *Pronous* makes a small web in leaf litter and disappears into litter at the slightest disturbance. Presumably by spending much time sifting leaf litter, Chickering got more specimens than other collectors.

The genera in this revision are not closely related. *Actinosoma* has a paramedian apophysis, the conductor is in the middle of the tegulum area, there are no spines on the median apophysis, and there is no distal hematodocha (Fig. 9); in the female the epigynum is a broad lobe (Figs. 1–3). The characters cited are synapomorphies with *Alpaida* O. P.-Cambridge (Levi, 1988). *Tatepeira,* the other extreme, lacks a paramedian apophysis and has the conductor on the side of the tegulum, and the median apophysis has spines and well-de-

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TABLE 1. SOME CHARACTERS OF SPECIES BELONGING TO GENERA REVISED HERE, WITH OTHER GENERA INCLUDED FOR COMPARISON.

	ACT	ALP	*SPI*	*HIN*	MCA	*PRO*	*MEP*	*SPL*	ACA	*MAD*	AM	*TAT*	ARA	NEO
PME	–	–	–	[+]	–	[+]	–	–	–	–	–	–	–	–
head	–	–	–	–	[+]	–	–	+	+	–	–	–	–	–
IV > I	–	–	–	–	+	+	–	–	–	–	–	–	–	–
abd.shape	[+]	–	[+]	[+]	[+]	[+]	[+]	–	–	[+]	[+]	[+]	–	–
abd.pttrn.	+	–	–	–	–	–	–	[+]	[+]	–	–	–	–	–
abd.spins.	+	–*	–	–	–	–	–	–	–	–	–	–	–	–
epig.lobe	+	+	+	+	+	–	[+]	+	+	–	–	–	–	–
epig.scp.	–	–	–	–	–	–	[+]	–	–	+	+	+	+	+
scape pnt.	–	–	–	–	–	–	[+]	–	–	–	+	+	–	–
scape pck.	–	–	–	–	–	–	–	–	–	–	–	–	+	+
♂ dwarf	–	–	?	–	+*	+	–	+	–	–	–*	–	–*	–
♂ abdom	–	–	?	–	+	+	–	[+]	–	–	–	–	–	–
patella	1	1*	?	1	1	1	1	1	1	2	2*	2	2*	2
M tooth	–	–	?	–	–	–	+	–	–	+	+	+	+	+
flagella	–	–	?	–	–	–	+	–	–	–	+	+	–	–
PM	+	+	?	+	+*	?	–	?	+	–	–	–	–	–
C on edge	–	–	?	–	–*	–	–	–	–	+	+	+	+	+
DH	–	–	?	–	–	–	–	–	–	+	+	+	+	+
A	+	+	?	+	+	–	–	–	+	+	+	+	+	+
A cplx.	–	+	?	–	–	–	–	–	–	+	+	+	+	–

Genera: ACA, *Acacesia*; *ACT, Actinosoma*; ALP, *Alpaida*; AM, *Amazonepeira*; ARA, *Araneus*; *HIN, Hingstepeira*; *MAD, Madrepeira*; MCA, *Micrathena*; *MEP, Micrepeira*; NEO, *Neoscona*; *PRO, Pronous*; *SPI, Spinepeira*; *SPL, Spilasma*; *TAT, Tatepeira*. Revised genera are set in italic.

Abbreviations: PME, posterior median eyes modified; head, cephalic region modified; IV > I, leg 4 longer than leg 1; abd.shape, abdomen shape modified; abd.pttrn., abdomen pattern modified; abd.spins., median posterior spines or tubercles present; epig.lobe, epigynum a lobe; epig.scp., epigynum with scape; scape pnt., scape tip pointed; scape pck., scape tip with distal pocket; ♂ dwarf, male dwarfed and may lack endite tooth, coxal hook; ♂ abdom, male abdomen modified with ventral scutum; patella, palpal patella with 1 or 2 setae; M tooth, median apophysis with tooth; flagella, median apophysis with flagella; PM, paramedian apophysis; C on edge, conductor on edge of tegulum; DH, distal hematodocha present; A, terminal apophysis present; A cplx., terminal apophysis branched. +, present; [+], an autapomorphy of genus; –, absent; *, variable in some species.

veloped distal hematodocha (Fig. 224); the female has an epigynum with an annulated scape (Figs. 217–219) and a pair of humps on the abdomen (Fig. 220). These characters all are synapomorphies with *Araneus* and *Aculepeira*. Other genera here, *Pronous, Micrepeira*, and *Spilasma*, have some intermediate characters (Table 1).

Readers of manuscripts often suggest that more information on apomorphies should be provided for construction of cladograms. But while some help can be given, the judgment about what is a good apomorphy is subject to reconsideration and relies on knowledge of other genera, some not yet revised. A study of relationships and useful apomorphies will be in order at the end of the revisions. Some examples of recent changes follow: Earlier it was thought that the presence of one or two macrosetae on the male palpal patella was useless in phylogeny and was not used. Now, however, despite many exceptions, it appears that the *Araneus* group of genera generally has two macrosetae, while those close to *Alpaida* have one (Table 1). In another example, the usual armature of araneid males, such as an endite tooth, a hook on the first coxa, or the modified second tibia seems to be lost in males that are very small compared to the female [with many exceptions, e.g., *Acanthepeira* Marx (Levi, 1976)]. At present, such armature is of little use in phylogeny. Another case of changed value concerns the pointed scape of the epigynum and the paired flagella of the median apophysis in the male palpus, formerly considered a synapomorphy for about five genera close to *Araneus*. But now these features are also noted in *Micrepeira* (Fig. 162, M in Fig. 179), which otherwise is close to *Alpaida* O. P.-Cambridge (Levi, 1988). At this stage the best information that can be provided is limited to the autapomorphies of individual revised genera.

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AD	A. Dean, College Station, Texas, United States
AMNH	American Museum of Natural History, New York, United States; N. Platnick, L. Sorkin
BMNH	Natural History Museum, London, England; P. Hillyard, F. Wanless
CAS	California Academy of Sciences, San Francisco, California, United States; W. J. Pulawski, D. Ubick, C. Griswold
DU	D. Ubick, San Francisco, California, United States
FMLT	Fundacion Miguel Lillo, Tucumán, Argentina; J. A. Corronca
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, United States; G. B. Edwards
HECO	Hope Entomology Collections, Oxford University, Oxford, England; I. Lansbury, M. Atkinson
INPA	Instituto Nacional de Pesquisas da Amazônia, Manaus, Est. Amazonas, Brazil; C. Magalhaes
IRSNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium; L. Baert
JAK	J. A. Kochalka, Ciudad Universitaria, Paraguay
MACN	Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina; E. A. Maury
MCN	Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil; E. H. Buckup
MCP	Museu de Ciências, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Rio Grande do Sul, Brazil; A. A. Lise
MCZ	Museum of Comparative Zoology, Cambridge, Massachusetts, United States
MECN	Museo Ecuatoriano de Ciencias Naturales, Quito, Ecuador; L. Avilés
MEG	M. E. Galiano; Buenos Aires, Argentina
MHNG	Muséum d'Histoire Naturelle, Genève, Switzerland; V. Mahnert
MIUP	Museo de Invertebrados, Universidad de Panamá, Panama; D. Quintero A.
MNHN	Muséum National d'Histoire Naturelle, Paris, France; J. Heurtault, C. Rollard
MUSM	Museo de Historia Natural, Universidad Nacional Mayor de San Marcos, Lima, Peru; D. Silva D.
MZCR	Museo Zoologico de Universidad de Costa Rica, San José, Costa Rica; C. E. Valerio
MZSP	Museu de Zoologia, Universidade de São Paulo, São Paulo, SP, Brazil; P. Vanzolini, J. L. Leme
MZUF	Museum Zoologico de La "Specola," Università di Firenze, Florence, Italy, L. Bartolozzi, S. Mascherini
NMB	Naturhistorisches Museum, Basel, Switzerland; E. Sutter, A. Hänggi
NRMS	Naturhistoriska Riksmuseet, Stockholm, Sweden; T. Kronestedt
PAN	Polska Akademia Nauk, Warszawa, Poland; J. Prószynski, A. Slojewska, E. Kierych
REL	R. E. Leech, Edmonton, Alberta, Canada
RLCB	R. L. C. Baptista, Rio de Janeiro, Brazil
SMF	Forschungsinstitut Senckenberg, Frankfurt am Main, Germany; M. Grasshoff

UCVC	Universidad Central de Venezuela, Caracas, Venzuela; J. Racenis
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C., United States; J. Coddington, S. F. Larcher
ZMK	Zoologisk Museum, Copenhagen, Denmark; H. Enghoff
ZSM	Zoologische Staatssammlung, Munich, Germany

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METHODS

Most methods used in these studies are described in Levi (1993a).

Internal genitalia of *Pronous* specimens were examined by removing the epigynum using minutennadeln (used otherwise for mounting small insects) mounted on a wooden stick. The epigynum was placed in Hoyer's medium between two coverslips so that either side could be examined. An outline drawing was made with a dissecting microscope, at the same magnification as the illustration of the epigynum. Details were added later. Finally, the epigynum was removed from the mount and placed in a 2-by-4-mm glass vial stoppered with cotton and kept with the female specimen.

Palpi were spread out by pulling apart rather than by expanding, because pulling apart keeps all sclerites in similar positions and makes it easier to match and illustrate the labeled sclerites with those of the contracted palpus. This is of special importance in genera related to *Araneus* that have well-developed distal hematodocha.

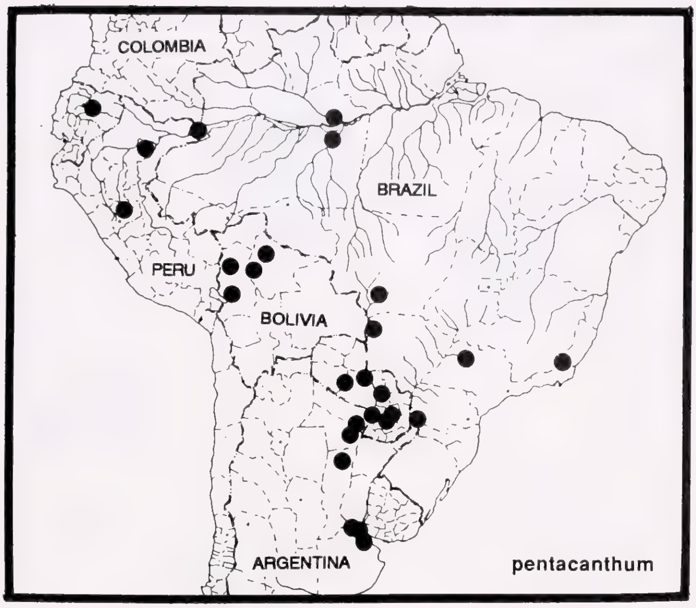
The sizes of the eyes are expressed as diameters of the anterior median eyes; distances between eyes of the anterior row are expressed as diameters of the anterior median eyes (in profile), and distances between eyes of the posterior row are given as diameters of the posterior median eyes (in profile). The height of the clypeus, the distance between the anterior median eyes and the edge of the carapace, is expressed as diameter of the anterior median eyes (Levi, 1993a, fig. 28f). These measurements are approximate.

To examine for the presence of a tapetum, the eyes of *Pronous* specimens were first checked with reflected light. When no tapetum was found in the posterior median eyes, the eye region of the carapace (of a female *P. quintana*) was cut off, cleared with methyl benzoate, and examined more carefully.

Actinosoma Holmberg

Actinosoma Holmberg, 1883: 239. Type species *Actinosoma pentacanthum* (Walckenaer) designated by Holmberg and by monotypy. The gender of the name is neuter (Bonnet, 1955: 156).

Diagnosis. *Actinosoma* is readily separated from all other Neotropical araneid genera by the five large sclerotized, orange spines on the abdomen of both female and male (Figs. 4–6, 10), an autapomorphic character. The genitalia are very similar to those of *Alpaida*, but the terminal apophysis of the male palpus is a simple structure (A in Fig. 9); in *Alpaida* it is subdivided.



Map 1. Distribution of *Actinosoma pentacanthum.*

Actinosoma differs from *Micrathena,* with which it is commonly confused, by having the first pair of legs longer than the fourth, by lacking stridulating structures on the book-lungs (present in most *Micrathena*), and by lacking a square to rectangular abdomen of the male. The abdomen of male *Actinosoma* has spines (Fig. 10) just as in the female; male *Micrathena* lack them.

Description. Female. Abundant black pigment between median eyes (Fig. 7). Width of cephalic region behind eyes slightly more than half thoracic width. Epigynum with projecting, rounded shelf, its tip a rounded lobe (Figs. 1–3) as in *Alpaida.*

Male. Width of eye region behind eyes about half the width of the thoracic region (Fig. 11). Palpus with conductor in middle of tegulum (Fig. 8, C in Fig. 9); tegulum without sclerites on distal, ventral side (right, in left palpus at 3 hr in Fig. 8, T in Fig. 9). Paramedian apophysis (PM in Fig. 9) is a separate, lightly sclerotized, L-shaped sclerite attached by soft stalk to conductor. Median apophysis cup-shaped (M in Fig. 9; Levi, 1988, fig. 10), as it often is in *Alpaida.* Embolus supported by paramedian apophysis; its tip on conductor (E in Fig. 9). Terminal apophysis a narrow lobe above embolus (A in Fig. 9).

Relationship. The lobe of the epigynum of the female resembles that of *Alpaida* (see Levi, 1988) and *Micrathena* (see Levi, 1985); it is a synapomorphy. The palpus has the conductor in the center of the tegulum (C in Fig. 9) as in *Alpaida* and *Micrathena,* and there is a paramedian apophysis (PM in Fig. 9) as in these two genera [it may be missing in some *Micrathena* (Levi, 1985)], another synapomorphy of various genera. Unlike *Araneus, Neoscona, Madrepeira, Tatepeira,* and others (Figs. 213, 224), the median apophysis lacks sharp spines or flagella-like extensions.

Natural History. Actinosoma pentacanthum lives on emergent aquatic vegetation above the water surface in the middle of ponds and puddles.

Distribution. Only one species is widespread in South America (Map 1).

Misplaced. Actinosoma heteracantha

Mello-Leitão, 1943, is *Wagneriana heteracantha* (Mello-Leitão) (Levi, 1991c).

Actinosoma riscoi Archer (1971: 158, figs. 3, 4, ♀) is *Rubrepeira rubronigra* (Mello-Leitão) (Levi, 1991a).

Actinosoma pentacanthum (Walckenaer)
Figures 1–12; Map 1

Plectana pentacantha Walckenaer, 1841: 170. Locality of specimens not known but may have been from Cayenne (French Guiana); specimens lost.

Acrosoma stelligerum Thorell, 1860: 301; 1868: 26. Origin of specimen unknown and type specimens not in NRMS, lost. Specimens determined by Thorell from Corumbá, Mato Grosso [Mato Grosso do Sul], Brazil, in NRMS, examined. Similarity of description of *stelligerum* and *pentacantha* first noticed by Butler (1873). Name first synonymized by Holmberg (1883).

Acrosoma pentacanthum:—Butler, 1873: 428. Holmberg, 1883: 237.

Acrosoma pulcherrima Holmberg, 1876: 143 (p. 21 in a separate publication, not seen). Specimens from Puerto Obligada [Vuelta de Obligado, Prov. Buenos Aires, 33°35′S, 59°49′W (USDI, 1968)], Argentina, lost. First synonymized by Holmberg (1883).

Actinosoma pentacanthum:—Holmberg, 1883: 239. Roewer, 1942: 778. Bonnet, 1955: 156.

Cyrtarachne quinquespinosa Keyserling, 1892: 55, pl. 3, fig. 44, ♀, ♂. Five immature and five female syntypes from Espírito Santo, Brazil, in USNM, examined. Göldi, 1892: 227. First synonymized by Simon (1895).

Araneus pentacanthus:—Simon, 1895: 819, fig. 869, ♀. Badcock, 1932: 27.

Araneus pentacantha:—Zapfe, 1957: 29, fig. 3, ♀, ♂.

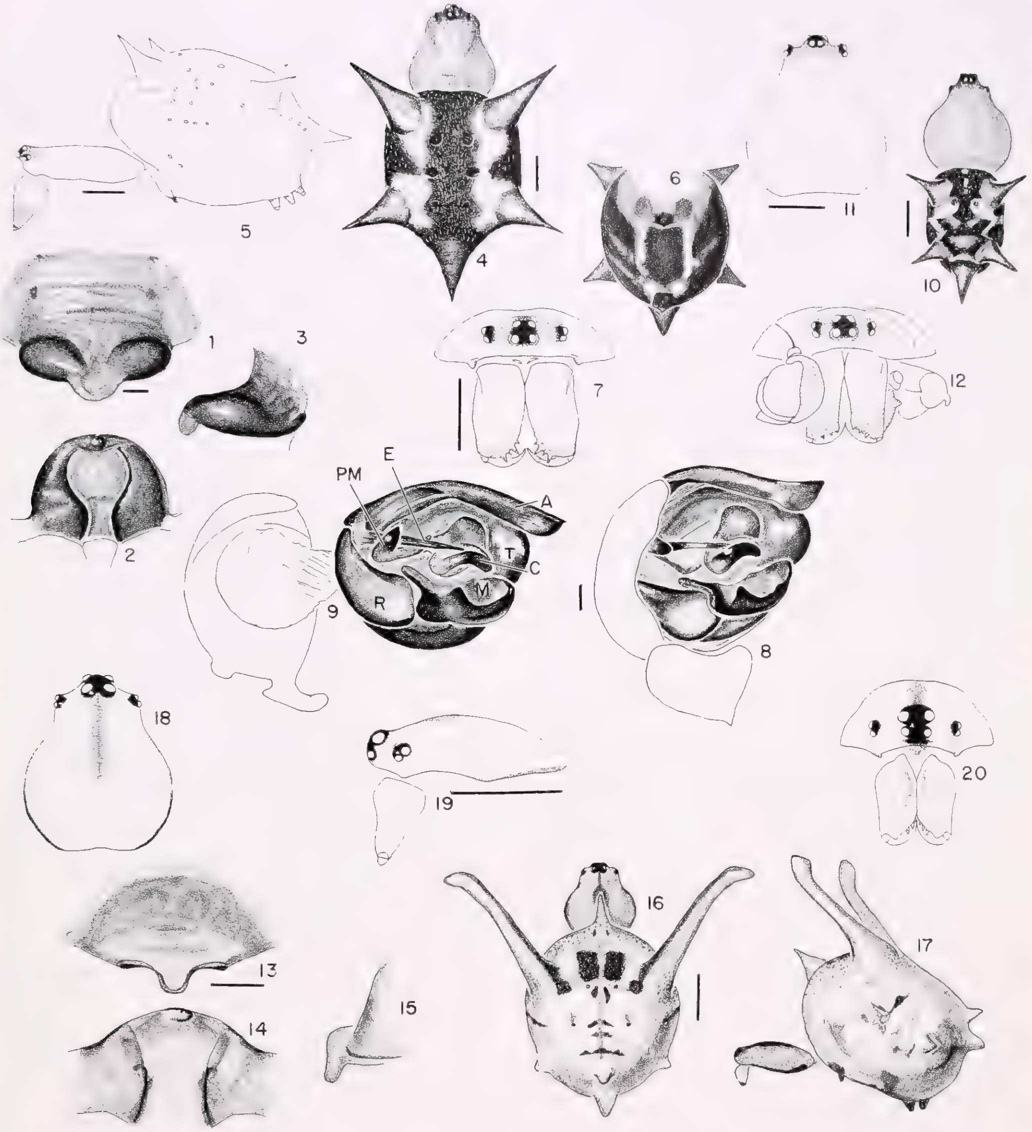
Note. Acrosoma Perty, 1833, with the type species *A. swainsoni,* is a subjective synonym of *Micrathena* (Levi, 1985). *Cyrtarachne* Thorell (1868: 10) was a name to replace *Cyrtogaster* Keyserling (1864: 80) [the name preoccupied by Walckenaer (1833) for a hymenopteran]. The genus has the type *Cyrtogaster grubei,* by monotypy, from Mauritius, Indian Ocean, for an araneid with the carapace high in thoracic region and abdomen triangular, wider than long, pointed behind, and having four dorsal tubercles.

According to Holmberg (1883: 227), the information of 1876 was published on page 143, 1876 (date from Holmberg); it is page 21 on a photocopy of the journal that was available.

The syntypes of *Cyrtarachne quinquespinosa* were unexpectedly found in unsorted collections of the USNM. The USNM specimens were recognized as Keyserling specimens because they were labeled "Espirito Santo, Cyrtarachne 5-spinosa Keys.", on a label, 24 by 30 mm, having toothed perforations on all four sides and a blue frame, a short distance inside from the white teeth. This is a typical Keyserling label. A second plain old label in the vial read "Espirito Santo, Rio Minas".

Description. Female from Puerto Napo, Ecuador. Carapace orange, eye region black. Chelicerae orange, distally black. Labium, endites black. Sternum, coxae orange; legs without rings, dusky black, femora darkest. Dorsum of abdomen with orange and black, the black including paired white patches (Fig. 4); venter black with a pair of white lines (Fig. 6). Eyes subequal. Anterior median eyes their diameter apart, 2 diameters from laterals. Posterior median eyes 0.8 diameter apart, 2.5 diameters from laterals. Ocular quadrangle slightly narrower behind than in front, slightly longer than wide. Height of clypeus equals 1.1 diameters of anterior median eye. Abdomen with five prominent spines (Figs. 4–6). Total length 8.0 mm. Carapace 3.2 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 3.4 mm, patella and tibia 3.9, metatarsus 2.7, tarsus 1.5. Second patella and tibia 3.3 mm, third 2.3. Fourth femur 3.4, patella and tibia 3.7, metatarsus 2.5, tarsus 1.1.

Male from Puerto Napa, Ecuador. Coloration as in female (Fig. 10). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.7 diameter apart, 1.4 diameters from laterals. Posterior median eyes 0.6 diameter apart, 2 diameters from laterals. Ocular quadrangle narrower behind, slightly longer than wide. Height of clypeus equals 1.2 diameters of anterior median eye. Endite with tooth facing a tubercle on the coxa and a tooth on the proximal end of the palpal femur. Palpal patella with one macroseta. First coxa with hook. Second tibia thicker than first but



Figures 1–12. *Actinosoma pentacanthum* (Walckenaer). 1–7, female. 1–3, epigynum. 1, ventral. 2, posterior. 3, lateral. 4, dorsal. 5, lateral. 6, abdomen ventral. 7, eye region and chelicerae. 8–12, male. 8, left palpus, mesal view. 9, palpus pulled apart. 10, dorsal. 11, carapace. 12, eye region, chelicerae and right palpus.

Figures 13–20. *Spinepeira schlingeri* n. sp., female. 13–15, epigynum. 13, ventral. 14, posterior. 15, lateral. 16, dorsal. 17, lateral. 18, carapace. 19, carapace and chelicera. 20, eye region and chelicerae.

Abbreviations. A, terminal apophysis. C, conductor. E, embolus. M, median apophysis. PM, paramedian apophysis. R, radix. T, tegulum.

Scale lines. 1.0 mm, genitalia 0.1 mm.

without macrosetae. Abdomen as in female (Fig. 10). Total length 6.7 mm. Carapace 3.1 mm long, 2.3 wide; 1.1 behind lateral eyes. First femur 3.4 mm, patella and tibia 3.8, metatarsus 2.4, tarsus 1.1. Second patella and tibia 3.1 mm, third 2.0. Fourth femur 3.3 mm, patella and tibia 3.4, metatarsus 2.1, tarsus 1.0.

Note. Males and females were collected together.

Variation. Total length of females 7.0 to 9.7 mm, males 6.0 to 7.0 mm. The bases of the five spines vary in width in different specimens. Specimens from the Napo River, Ecuador, were used for the illustrations, except for the dorsal view of the female (Fig. 4), which was made from a specimen from Mato Grosso, Brazil (NRMS). Recently collected specimens had bright orange, black, and white coloration.

Diagnosis. The abdomen with five sclerotized spines in both males and females (Figs. 4, 5, 10), and the orange, white, and black coloration, separates the species from all other araneids.

Natural History. Holmberg (1876) captured the spiders along the sides of a brook. Göldi (1892) found this red spider in earthen organ-pipe tubes of wasps, which were attached to walls and window frames in Santo Antônio de Pádua, Est. Rio de Janeiro, Brazil. The Colombian specimens were taken from a *Sceliphron* wasp nest. All others were from ponds or streams. Specimens from the Napo River, Ecuador, were collected by sweeping below water and water surface in middle of a swamp. A female from Manaus, Brazil, came from *Paspalum* grass, which forms vast floating meadows in Amazonian rivers. Badcock (1932: 27) recorded the species as "common everywhere on surface of swamps" in Paraguayan Chaco. Badcock's locality is described by Carter (1928: 97), the collector, as an island surrounded by swamps with daily maximum temperatures of 90° F (42° C), mean 85° F (30° C), with surface layer of water at 108° F (43° C). A specimen from Paraguay (MHNG) was collected in a swamp. Corronca (personal correspondence) reported webs in flooded grasslands, in tropical Bañado areas. When the web is disturbed, the spider dives or walks on the water surface. This species is probably just as common in rain forest ponds as in wet areas of dry regions, but collectors are more likely to be attracted to marshes and ponds in dry areas. Galiano reported in collecting data from Santa Fé Province, Argentina, that the spider makes a horizontal web on floating plants.

Distribution. Amazon area to Buenos Aires Province, Argentina (Map 1).

Specimens Examined. COLOMBIA *Amazonas:* 25 km N Leticia, 2♀ (MCZ). ECUADOR *Napo:* 10 km E Puerto Napo, S side Río Napo, 6♀, 6♂, 14 imm. (MCZ). PERU "northern PERU", Reanrer [local. ?], 4♀ (AMNH). *Loreto:* Parinari Canyon, Río Samiria, 1♀, 1♂, imm. (AMNH). *Huánuco:* Monzón Valley, Tingo María, 1♀, 1♂ (CAS). BRAZIL *Amazonas:* Porto América [05°10'S on Rio Madeira or 07°39'S on Rio Purus, Vanzolini, personal communication], 1♀ (AMNH); Rio Autáz, Santa Amelia, 1♀ (NRMS); Rio Autáz, Cururuzinho, 1♂ (NRMS); Manaus, Bilhares, 2♂ (NRMS); Manaus, Flores, 1♀ (NRMS); Rio Negro, 1♀ (MZSP); Manaus, Igarapé, km 30, M-Caracaraí, 1♀ (INPA); Manaus, 1♀ (INPA). *Mato Grosso:* Poconé, km 11 Transpantaneira, imm. (MCZ). *Rio de Janeiro:* Santo Antônia de Pádua (Göldi, 1892). *São Paulo:* Reprisa, São José de Rio Preto, 1♀, 1♂ (MZSP). BOLIVIA *El Beni:* Yacuma, Éspirito, 1♀ (ZSM); Rosario, 2♀ (USNM); 1♀ (M. R. Lopez, USNM). *La Paz:* Reyes, 14°03'S, 68°01'W (Zapfe, 1957); upper lake on Chacaltaya, 1♀ (ZSM). PARAGUAY *San Pedro:* 2 km NW Lima, imm. (MHNG). *Presidente Hayes:* Transchaco, km 320, 2♀ (IRSNB); Makthlawaiya (Badcock, 1932). *Paraguari:* nr. Ybytymí, 11♀, 5♂ (MCZ). *Guairá:* As. Tacuara. *Central:* Esterus del San Lorenzo, 1♀, 1♂ (CAS); Asunción, 1♀ (MCZ); Villa del Maestro, San Lorenzo, 2♀, 1♂, 2 imm. (MHNG). *Caaguazu:* 20 km N Cnl. Oviedo, 1♀ (MHNG). ARGENTINA *Formosa:* Reserva Ecologica El Bagual, 5♀, 1♂ (FMLT, MCZ). *Chaco:* Selva del Rio de Oro, 1♀, 1♂ (MEG). *Santa Fé:* Arroyo El Toba, 1♀, 1♂ (MEG); Tortagal, 5♀, 1♂ (FMLT). *Buenos Aires:* San Nicolás, Baradero, Pilar (Holmberg, 1883); Buenos Aires, 1♀ (MCZ); Delta de Parana, Arroyo Espera, 1♂ (MEG); Escobar, 1♂ (MACN); Campana, 2♀ (CAS); Tigre, 2♀ (BMNH).

Spinepeira new genus

Type species. *Spinepeira schlingeri.* The name is an arbitrary combination of letters attached to "epeira". The name of the genus is feminine.

Diagnosis. This genus, which is close to *Alpaida*, differs by having a pair of long projections on the abdomen, one anterior median tubercle, and two posterior median tubercles (Figs. 16, 17).

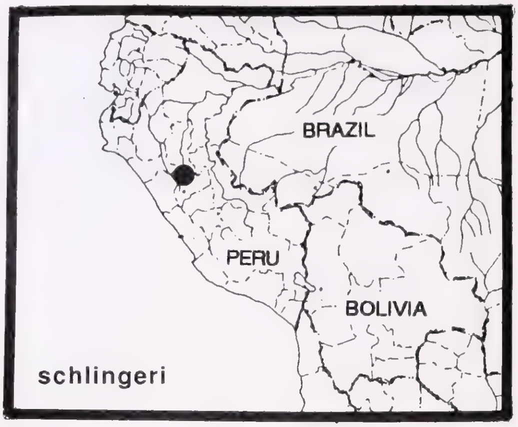
Relationship. The two posterior median tubercles represent a synapomorphy found in numerous genera including *Alpaida, Acanthepeira, Eriophora, Eustala,* and *Wagneriana.* With the exception of *Eustala,* these genera have males with a paramedian apophysis in the palpus. Additional characters placing the genus close to *Alpaida* are the black pigmentation between the median eyes (Figs. 18–20) and lack of setae on the carapace.

Spinepeira schlingeri new species
Figures 13–20; Map 2

Holotype. Female holotype from Monzón Valley, Tingo María, Depto. Huánuco, Peru, 18 Dec. 1954 (E. I. Schlinger, E. S. Ross), in CAS. The species is named after the collector, entomologist E. I. Schlinger.

Description. Female holotype. Carapace yellow-white, with a longitudinal black line through the middle, area between median eyes black (Fig. 18). Chelicerae, labium, endites, sternum black. Legs yellow-white. Dorsum of abdomen with pairs of black and white patches (Figs. 16, 17); venter with genital area and spinnerets black and a large black patch between (Fig. 17). Posterior median eyes 1.5 diameters of anterior medians, anterior laterals 1 diameter, posterior laterals 1.5 diameters. Anterior median eyes 1.3 diameters apart, 2 diameters from laterals. Posterior median eyes their diameter apart, 1.5 diameters from laterals. Ocular quadrangle wider behind than in front. Height of clypeus equals 1 diameter of anterior median eye. Abdomen with a pair of long projections and one pair of lateral tubercles, an anterior median tubercle and two posterior median tubercles (Figs. 16, 17). Total length 5.5 mm. Carapace 1.7 mm long, 1.5 wide, 0.9 wide behind lateral eyes. First femur 2.2 mm, patella and tibia 2.7, metatarsus 2.0, tarsus 0.7. Second patella and tibia 2.0 mm, third 1.3, fourth 1.8.

No additional specimens have been found.



Map 2. Distribution of *Spinepeira schlingeri.*

Hingstepeira new genus

Type species. Epeira folisecens Hingston, 1932. The name is an arbitrary combination of letters linking part of explorer Hingston's name to "epeira". The gender of the name *Hingstepeira* is feminine.

Diagnosis. Hingstepeira is separated from most other araneid genera by the shape of the abdomen: elongate, oval, usually widest at the posterior half (Fig. 24), with the spinnerets overhung by an anterior to the posterior tip of the abdomen (Figs. 25, 39, 44, 52). It differs from *Singa* by having less black coloration in the median eye region (Figs. 26–28) and by the genitalia, especially the palpus, which in *Hingstepeira* has a prominent paramedian apophysis (PM in Fig. 30). In the close spacing of the posterior median eyes (Fig. 38) and the shape and color of the abdomen, *Hingstepeira* is similar to *Metazygia*, but the paramedian apophysis of the male palpus (PM in Fig. 30) separates the genera. Unlike other male araneids, except the males of *Metazygia gregalis* (O. P.-Cambridge), *M. benella* Levi, and *M. yobena* Levi, the *Hingstepeira* male has the distal end of the chelicerae modified and with a frontal tooth (Fig. 33). The *Metazygia* species have a widened fang faced by a wide anterior tooth (Levi, 1994, fig. 261).

There are other genera in which the females have an elongate abdomen extending beyond the spinnerets. *Hingstepeira* lacks the thick first pairs of legs of the southeast Asian *Perilla* Thorell, 1895, and *Hingstepeira*'s abdomen is wider. [*Perilla* has been placed by Brignoli (1983) in Nephilinae, which belongs in the family Tetragnathidae.] *Hingstepeira* differs from the Mediterranean and African *Nemoscolus* Simon, 1895, by having a paramedian apophysis in the palpus.

Hingstepeira differs from *Arachnura* Vinson, 1863, which has a similar web, by lacking the narrow tail; also, the male *Hingstepeira* lacks a sclerotized shield on the abdomen. *Hingstepeira* differs from the Indopacific *Milonia* Thorell, 1890, in lacking *Milonia's* silver coloration. (*Milonia* may be a tetragnathid.)

Description. Cephalothorax glabrous, orange to orange-brown, median eye region black, without marks; cephalic area darker than thorax. Cephalic region in both sexes wide behind lateral eyes, more than half width of thoracic region (Figs. 26, 32). Median ocular quadrangle narrower behind than in front. Abdomen oval, longer than wide, widest in middle or posterior (Fig. 24). Abdomen coloration variable; all but one species (*H. isherton*) with transverse black rectangle between epigynum and spinnerets (Figs. 25, 44, 52). Epigyna variable, often with a smooth, bulbous projection (Figs. 21, 35).

The male of only one species (*H. folisecens*) is known. Male carapace slightly smaller than that of female (Figs. 32–34). Endite with tooth (Fig. 34) facing tubercle on palpal femur. First coxa with hook on distal margin (Fig. 34). Palpal patella with one macroseta (Fig. 34). First and second legs with macrosetae.

Relationship. The presence of the paramedian apophysis of the male palpus (PM in Fig. 30), the absence of a distal hematodocha, the presence of the conductor (C) in the middle of the tegulum, and the free section of the tegulum on the upper right in the left palpus (T in Fig. 30) place the genus close to *Alpaida*.

Natural History. The *Hingstepeira* web resembles that of *Arachnura* by having a coiled up leaf as retreat in the upper vertical radius (Pl. 1).

Distribution. There are four species, all South American, found in the Amazon area and Guyanas.

Separating Species. The species differ in the markings on the abdomen. Males and females of the same species have similar markings.

KEY TO SPECIES OF *HINGSTEPEIRA*

The only male known is that of *H. folisecens* (Figs. 29–34).

1. Epigynum with median knob-shaped structure (Figs. 21–23, 35–37) 2
– Epigynum otherwise, without median knob-shaped structure 3
2(1). In ventral view of epigynum, round structure facing posteriorly (Fig. 21); abdomen with a dorsal, median, posterior black patch (Fig. 24) .... *folisecens*
– In posterior view of epigynum, round structure facing anteriorly (Fig. 35); abdominal pattern is a series of facing brackets (Fig. 38) .... *isherton*
3(1). In ventral view of epigynum, the median area, anterior of a transverse bar, is concave (Fig. 40); abdomen with black bands on sides (Fig. 43) .... *arnolisei*
– In ventral view epigynum convex (Figs. 45, 48); abdomen with two dorsal black bands (Fig. 51) .... *dimona*

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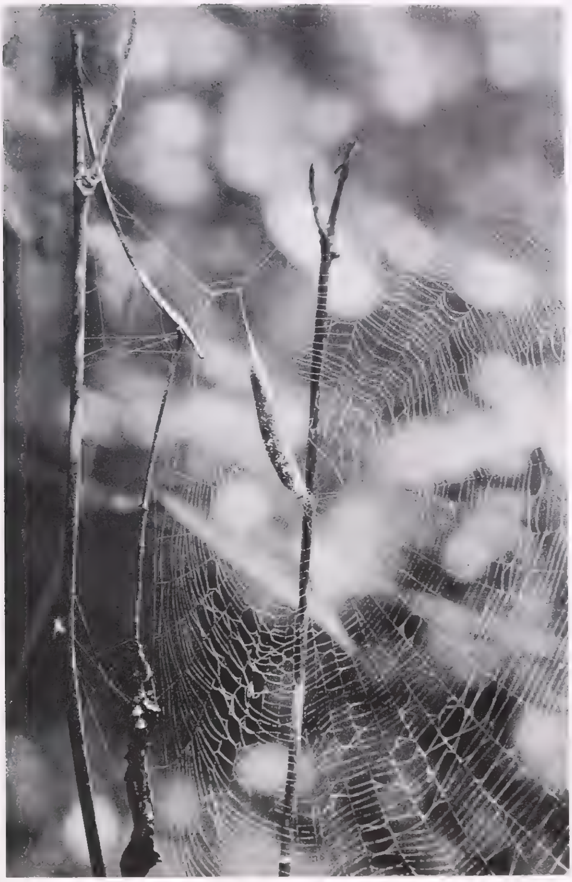
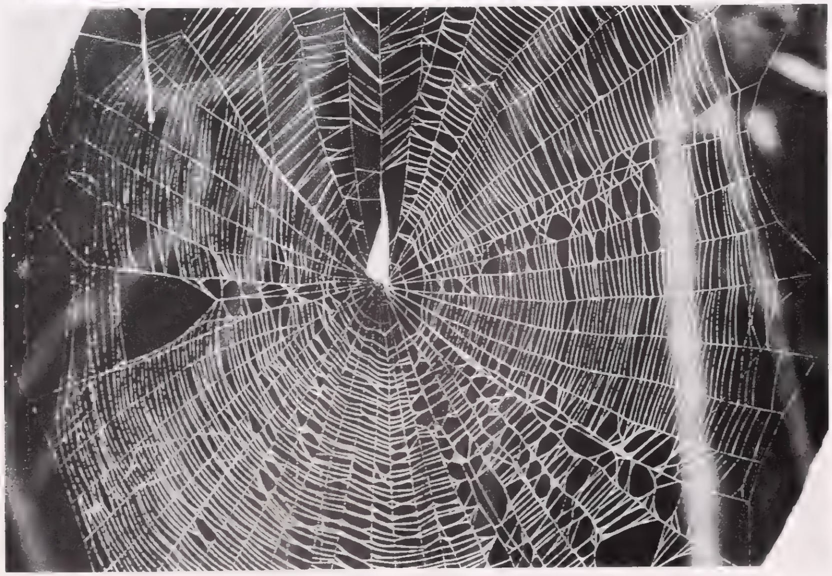
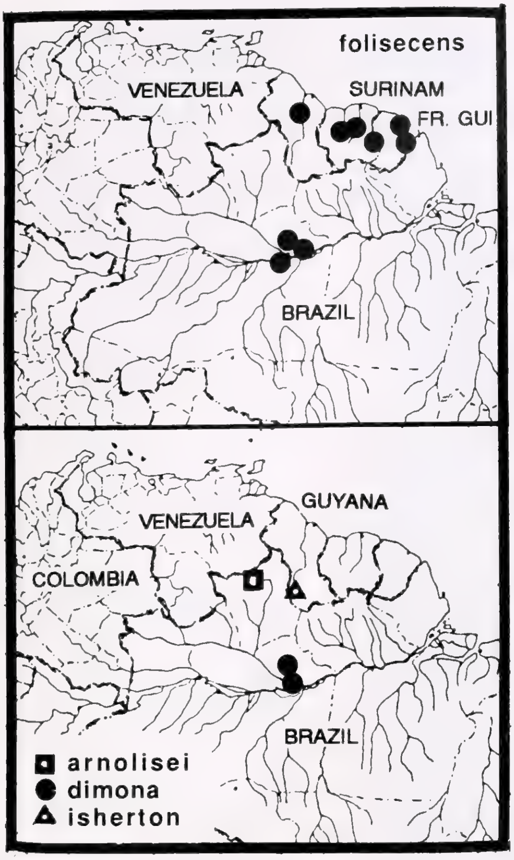
Plate 1. *Hingstepeira folisecens* (Hingston). Upper web with 35 cm diameter, hub about 140 cm above forest floor. Lower web about 35 cm diameter, hub 160 cm above forest floor (photos, H. Höfer).







Map 3. Distribution of *Hingstepeira* species.

Hingstepeira folisecens (Hingston)
Plate 1; Figures 21–34; Map 3

Epeira folisecens Hingston, 1932: 364, figs. 51, 52, webs. Female from Moraballi Creek, 2 mi [3.2 km] east of Essequibo River, 12 mi [19 km] south of Bartica, Guyana, lost. Not in BMNH, HECO.

Larinia bristowei Mello-Leitão, 1940: 180, figs. 6, 7, ♂. Male holotype from Moraballi Creek, Essequibo River, Guyana, in BMNH, examined. Brignoli, 1983: 272. NEW SYNONYMY.

Aranea folisecens:—Roewer, 1942: 842.

Araneus folisecens:—Bonnet, 1955: 504.

Note. Hingston's (1932, figs. 51, 52) illustration of the web of this species resembles the web recently photographed by H. Höfer (Pl. 1). Also, Hingston described the "abdomen . . . grey-brown darkening to apex which is nearly black, . . . with spinnerets at about the centre, area behind spinnerets brown, a quadrate black patch in front of spinnerets. . . . Total length 5 mm" (p. 364).

The type localities of *Epeira folisecens* and *Larinia bristowei* are the same.

Description. Female from Tarumã Mirím, Amazonas State, Brazil. Carapace orange, lightest posteriorly, area between eyes black. Chelicerae, labium, endites orange. Sternum, coxae light orange. Legs dusky orange. Dorsum of abdomen light gray, posterior end with a black patch (Fig. 24); venter with a dark, dusky trapezoidal patch between spinnerets and epigynum (Fig. 25). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.7 diameter apart, 1.3 diameters from laterals. Posterior median eyes 0.2 diameter apart, 2.5 diameters from laterals. Height of clypeus equals 0.4 diameter of anterior median eye. Abdomen elongate, widest behind middle (Fig. 24). Total length 5.7 mm. Carapace 2.1 mm long, 1.4 wide, 1.1 behind lateral eyes. First femur 1.3 mm, patella and tibia 1.8, metatarsus 0.7, tarsus 0.5. Second patella and tibia 1.6 mm, third 1.4, fourth 1.6.

Male holotype of *Larinia bristowei.* Carapace orange, black around eyes. Chelicerae, labium, endites, sternum, legs orange. Dorsum of abdomen whitish with three pairs of dusky patches and a black patch above spinnerets (Fig. 31); venter light gray. Posterior median eyes 0.6 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.6 diameter apart, slightly more than their diameter from laterals. Posterior median eyes 0.6 diameter apart, 3 diameters from laterals. Height of clypeus slightly less than diameter of anterior median eye. Abdomen oval (Fig. 31). First and second legs armed with macrosetae; second thicker than first. Total length 3.7 mm. Carapace 1.9 mm long, 1.4 wide. First femur 1.4 mm, patella and tibia 1.9, metatarsus 1.2, tarsus 0.6. Second patella and tibia 1.6 mm, third 1.1, fourth 1.5.

Note. Males and females have been collected together and share similar markings on the abdomen, although males are darker than females.

Variation. Total length of females 4.7 to 7.4 mm, males 3.1 to 4.6. The sides of the abdomen in ventral view may be dark. The posterior patch on the abdomen and ventral markings may be almost absent, or gray to black. Illustrations were made from a female from near Manaus, Brazil (Figs. 21–28), from the male holotype of *Larinia bristowei* (Fig. 29), and from specimens from near Manaus, Brazil (Figs. 30–34).

Diagnosis. The elongate abdomen and the characteristic markings, a black patch on the posterior end (Figs. 24, 25, 31), separate this species from all other araneids.

Natural History. Hingstepeira folisecens makes a vertical web with a curled leaf retreat attached to an upper radius (Hingston, 1932, figs. 51, 52; Pl. 1). Webs have been found in the interior and border of forests. They were found in igapó (periodically flooded forests) near Manaus and on the Manaus-Itacotiara in campina forest highway and in terra firma forest near Manaus. Adult males were common only during February and March.

Distribution. Guyanas and Brazilian Amazonian area (Map 3).

Specimens Examined. SURINAM *Saramacca:* Voltzberg-Raleighvallen Nature Reserve, 04°32′N, 56°32′W, 8 Feb. 1982, 1♀ (D. Smith Trail, MCZ). *Merowijne:* Anapaike Village, Lawa River, 8–29 Nov. 1963, 1♀ (E. Malkin, AMNH). *Brokopondo:* Browns Berg, 5°N, 55°27′W, 20 Feb. 1982, 1♀ (D. Smith Trail, MCZ). FRENCH GUIANA *Cayenne:* Montagnes Kaw, nr. Camp Calman, ca. 27 km SE Paura, 04°33′N, 52°09′W, 100–300 m, 25 Aug. 1988, 1♀; 1 Sept. 1988, 1♂ (S. Marshall, USNM). BRAZIL *Amazonas:* Tarumã Mirím, igapó, Manaus, 24 Apr. 1984, 1♀ (J. Adis, INPA); 25 Feb. 1987, 1♀ (H. Höfer, INPA); 5 Dec. 1987, 1♀ (H. Höfer, INPA); km 192, highway Manaus to Itacotiara, 18 Apr. 1987, 1♀ (H. Höfer, INPA); 80 km N Manaus, 9 Mar. 1989, 1♂ (H. Fowler, MCZ); Colosso Reserve, 80 km N Manaus, 18 Jan. 1989, 1♀, 1♂; Jan. 1989–June 1991, 63♀, 12♂; Reserva Cabo Frio, 80 km N Manaus, Oct. 1989–June 1991, 13♀, 3♂; 13 May 1992, 1♀; Reserva Dimona, 80 km N Manaus, 1989–1992, 3♀; Mar.–June 1991, 18♀; Reserva Km 41, 80 km N Manaus, Mar.–May 1991, 7♀; Reserva C. de Powell, 80 km N Manaus, 3♀; Reserva Florestal, 80 km N Manaus, 19 Feb. 1991, 3♀; Reserva Gavião, 21 Feb.–21 Oct. 1991, 3♀; (all H. Fowler, R. S. Vieira, E. Venticinque, MCZ); Reserva Porto Alegre, 80 km N Manaus, 1989–1992, 1♀; 27 May 1992, 1♀ (H. G. Fowler, MCZ).

Hingstepeira isherton new species
Figures 35–39; Map 3

Holotype. Female holotype from Isherton, Guyana, 10 Nov. 1937 (W. G. Hassler), in AMNH. The specific name is a noun in apposition after the locality.

Description. Female holotype. Carapace orange, cephalic region darkest. Chelicerae orange-brown. Labium, endites dark brown. Sternum orange, sides dusky. Legs orange. Dorsum of abdomen with white pigment spots and five pairs of brackets (Fig. 38); venter black around spinnerets fading into surrounding area, except for clear border posteriorly (Fig. 39). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.8 their diameter apart, 1.8 diameters from laterals. Posterior median eyes 0.2 diameter apart, 4 diameters from laterals. Height of clypeus equals 0.2 diameter of anterior median eye. Abdomen elongate oval, widest posteriorly (Fig. 38). Total length 7.0 mm. Carapace 3.4 mm long, 2.1 wide, 1.5 behind lateral eyes. First femur 2.3 mm, patella and tibia 3.0, metatarsus 2.0, tarsus 0.8. Second patella and tibia 2.7 mm, third 1.6, fourth 2.3.

Note. This female has a dorsal abdominal pattern similar to *Metazygia,* and its eyes resemble those of *Metazygia* (Levi, 1994). The epigynum also resembles that of *Metazygia goeldii* Levi. The main *Hingstepeira* character is the elongate abdomen (Fig. 38). Only finding a male will ascertain the placement.

Diagnosis. The shape of the epigynum (Figs. 35–37) and the dorsal abdominal pattern (Fig. 38) separate this species from other *Hingstepeira.*

Hingstepeira arnolisei new species
Figures 40–44; Map 3

Holotype. Female holotype from Ilha de Maracá, Rio Uraricoera, Roraima Stae, Brazil, 5 Dec. 1987

(A. A. Lise), in MCN no. 20062. The species is named after the collector.

Description. Female holotype. Carapace light orange-yellow. Chelicerae, labium, endites, sternum, legs yellowish white. Dorsum of abdomen with four longitudinal white bands, sides black anteriorly and posteriorly (Fig. 43); venter with a tranverse black rectangle between epigynum and spinnerets, sides black (Fig. 44). Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 1.2 diameters, posterior laterals 0.8 diameter. Posterior median eyes oval. Anterior median eyes their diameter apart, 2.3 diameters from laterals. Posterior median eyes their narrow diameter apart, 5 diameters from laterals. Height of clypeus equals diameter of anterior median eye. Abdomen elongate, 1.8 times as long as wide (Fig. 43). Total length 8.0 mm. Carapace 3.1 mm long, 2.3 wide, 1.8 behind lateral eyes. First femur 1.9 mm, patella and tibia 3.0, metatarsus 1.8, tarsus 0.9. Second patella and tibia 2.5 mm, third 1.7, fourth 2.5.

Diagnosis. Hingstepeira arnolisei differs from other *Hingstepeira* species by having a concave area on the anterior of the epigynum (Fig. 40) and by the lateral, black banding of the abdomen (Figs. 43, 44).

Hingstepeira dimona new species
Figures 45–52; Map 3

Holotype. Female holotype from Reserva Dimona, 80 km north of Manaus, Amazonas State, Brazil, in forest, 15 May 1991 (H. Fowler, R. S. Vieira, E. Venticinque), in MCN no. 25543. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace orange, darkest in midline. Chelicerae dark orange. Labium, endites, sternum orange. Legs orange with indistinct dark orange rings. Dorsum of abdomen with two black bands, midline and sides of bands white (Fig. 51); venter with a black transverse rectangle between epigynum and spinnerets, sides and posterior black (Fig. 52). Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.6 diameter apart, 2 diameters from laterals. Posterior median eyes 0.3 diameter apart, 2.7 diameters from laterals. Height of clypeus equals 0.5 diameter of anterior median eye. Abdomen oval (Fig. 51). Total length 5.2 mm. Carapace 2.5 mm long, 1.8 wide, 1.3 behind lateral eyes. First femur 1.8 mm, patella and tibia 2.3, metatarsus 1.4, tarsus 0.7. Second patella and tibia 1.9 mm, third 1.1, fourth 1.8.

Variation. Total length of females 4.7 to 6.0 mm. The borders of the posterior lateral plates of the epigynum (Figs. 46, 49) are variable. Figures 45–47, 51, and 52 were made from the female holotype, and Figures 48–50 from the specimen from Reserva Ducke.

Diagnosis. The domed structure of the epigynum (Figs. 45–50) and the dorsal black bands of the abdomen (Fig. 51) separate this species from other *Hingstepeira*. The species may belong to *Metazygia* and be close to *M. laticeps* (Keyserling) (Levi, 1995, figs. 226–230).

Natural History. All females were collected in forest.

Paratypes. BRAZIL *Amazonas:* Reserva Dimona, 80 km N Manaus, 26 Mar. 1991, 2♀; 17 May 1991,

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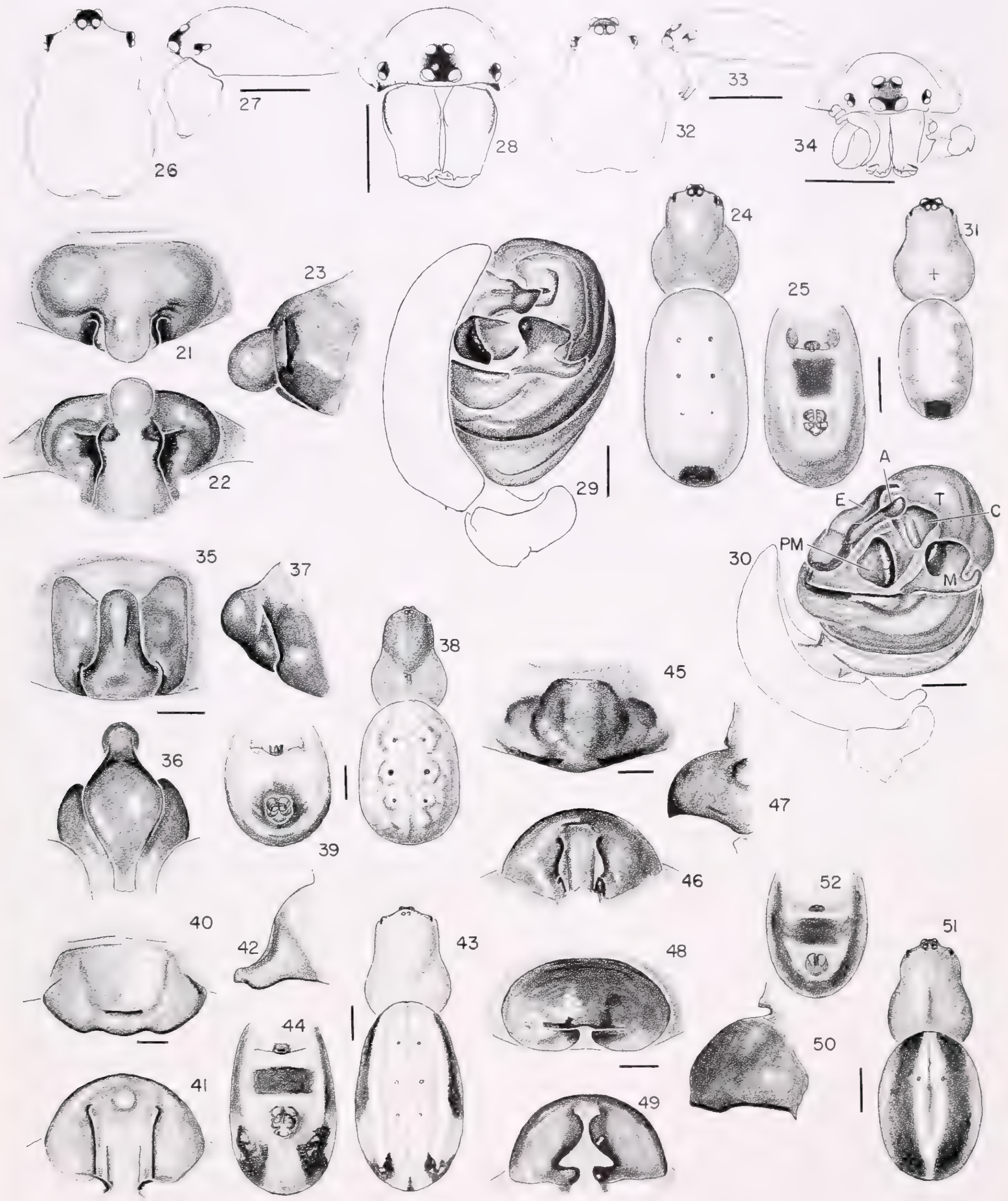
Figures 21–34. *Hingstepeira folisecens* (Hingston). 21–28, female. 21–23, epigynum. 21, ventral. 22, posterior. 23, lateral. 24, dorsal. 25, abdomen ventral. 26, carapace. 27, carapace and chelicera. 28, eye region and chelicerae. 29–34, male. 29, left palpus. 30, palpus pulled apart. 31, dorsal. 32, carapace. 33, carapace and chelicera. 34, eye region, chelicerae, and right palpus.

Figures 35–39. *H. isherton* n. sp., female. 35–37, epigynum. 35, ventral. 36, posterior. 37, lateral. 38, dorsal. 39, abdomen, ventral.

Figures 40–44. *H. arnolisei* n. sp., female. 40–42, epigynum. 40, ventral. 41, posterior. 42, lateral. 43, dorsal. 44, abdomen, ventral.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Figures 45–52. *H. dimona* n. sp., female. 45–50, epigynum. 45, 48, ventral. 46, 49, posterior. 47, 50, lateral. 45–47, (holotype). 48–50, (paratype). 51, dorsal. 52, abdomen, ventral.

Abbreviations. A, terminal apophysis. C, conductor. E, embolus. M, median apophysis. PM, paramedian apophysis.

Scale lines. 1.0 mm, genitalia 0.1 mm.

1♀; 25 June 1991, 2♀ (H. Fowler, R. S. Vieira, E. Venticinque, MCZ).

Specimens Examined. BRAZIL *Amazonas:* Reserva Ducke, Manaus, 26 July 1973, 1♀ (L. P. Albuquerque, MCN 20050); 27 Feb. 1974, 2♀ (L. P. Albuquerque, MCN 23561); Reserva Km 41, 80 km N Manaus, 21 May 1991, 1♀ (H. Fowler, R. S. Vieira, E. Venticinque, MCZ); Cabo Frio, 80 km N Manaus, 13 Mar. 1989, 1♀; 27 May 1989, 1♀ (H. Fowler, R. S. Vieira, E. Venticinque, MCZ).

Pronous Keyserling

Pronous Keyserling, 1881: 547. Type species *Pronous tuberculifer* Keyserling, 1881, by monotypy. The gender of the name is masculine (Bonnet, 1958: 3778).

Paphlagon O. P.-Cambridge, 1893: 117. Type species *Paphlagon beatus* O. P.-Cambridge, 1893, by monotypy. Species (erroneously) and genus synonymized with *P. tuberculifer* by O. P.-Cambridge (1898: 281).

Zigana Chamberlin and Ivie, 1936: 53. Type species *Zigana wixoides* Chamberlin and Ivie, 1936, by monotypy. NEW SYNONYMY.

Note. The synonymy of *Zigana* with *Pronous* was recognized by Chickering, judging from specimen labels, but was never published.

Diagnosis. The large posterior median eyes, which have lost their tapeta, are about twice the diameter of the anterior median eyes, face laterally, and are closer to the lateral eyes than to each other (Figs. 53–56, 58–62). This apomorphy separates *Pronous* from all other araneid genera including *Micrathena*. *Micrathena* and *Pronous* share two apomorphies: the fourth legs are longer than the first, and the abdomen of the male is almost rectangular (Figs. 61, 62).

Pronous differs from *Hypsosinga* by having the clypeus height equal to the diameter of the anterior median eye (in *Hypsosinga* the clypeus is higher) and by having the fourth legs longer than the first.

Pronous may be confused with linyphiid genera (e.g., *Dubiaranea* Mello-Leitão, 1943 = *Paranesticus* Mello-Leitão, 1944: 333 = *Hormembolus* Millidge, 1991), which have similar large posterior median eyes. The linyphiids, however, have a high clypeus and thinner legs and may have a sclerotized stridulating ridge laterally on the chelicerae.

Description. Female. Species all with similar coloration and pattern: cephalothorax orange to orange-brown, sides of thoracic region sometimes darker. Chelicerae, labium, and endites orange. Sternum light orange-red. Coxae and legs dusky orange to brown, rarely black. Abdomen light orange with six black patches, two on middle tubercles and two pairs on posterior tubercles (Figs. 56, 57). Some specimens have scattered white pigment spots, especially on anterior median tubercle, and gray to black shading on posterior and sides (Fig. 55). Venter usually without pigment, sometimes with a median black streak. Living specimens are all bright orange-red with black marks.

Carapace punctate. Anterior median eyes always slightly larger than laterals and posterior medians about 2 diameters of anterior medians (Figs. 53–55). Median eye quadrangle wider behind than in front (Fig. 53). Height of clypeus about equal to diameter of anterior median eyes. Legs with femur almost as long as patella and tibia. Unlike *Micrathena*, *Pronous* lacks a stridulating area on the book-lung covers. Carapace width behind lateral eyes about half maximum diameter of carapace (Fig. 53). Posterior median eyes about 2 diameters of anterior medians. Anterior eyes their diameter apart, about 2 diameters from laterals. Posterior median eyes 1 to 1.5 diameters apart, 0.5 to 0.8 diameter from laterals. Abdomen with a small anterior median tubercle and three pairs of tubercles, one pair in middle, two pairs posterior (Pl. 2, Figs. 56, 57). Anterior median tubercle usually absent in females from South America (Fig. 57). Epigynum (Fig. 63) without scape, sclerotic areas transparent and difficult to delineate.

Male. Slightly smaller than female. Carapace punctate. Width of carapace behind lateral eyes narrower than half of width in thoracic region (Fig. 58). Posterior median eyes 1.5 to 2 diameters of anterior median eyes. Anterior median eyes 0.6 to 1 diameter apart, 1 to almost 2 diameters from laterals. Posterior median eyes 1.1 to 1.5 their diameter apart, 0.5 to 1 diameter from laterals. Difference in length between first legs and longer fourth legs is always less in males than in females. Abdomen with a rectangular, lightly sclerotized, dorsal scutum, widest in anterior half, with only faint indications of tubercles (Figs. 60–62).

Male endite with tooth (Fig. 59), palpal femur with facing tubercle. Palpal patella with one macroseta (Fig. 59). First coxa with a small hook posteriorly on distal rim of margin, second femur with opposing small groove (Fig. 59). Second tibia with macrosetae on anterior face. Palpus with median apophysis within frame of tegulum in median view (M in Figs. 64, 65). Conductor positioned centrally on the tegulum (C in Figs. 64, 65). A lobe of tegulum overhangs conductor (at 12 hr in Figs. 64, 65). Embolus a curved structure, variable in thickness and shape in different species (E in Figs. 64, 65). Palpus without paramedian apophysis.

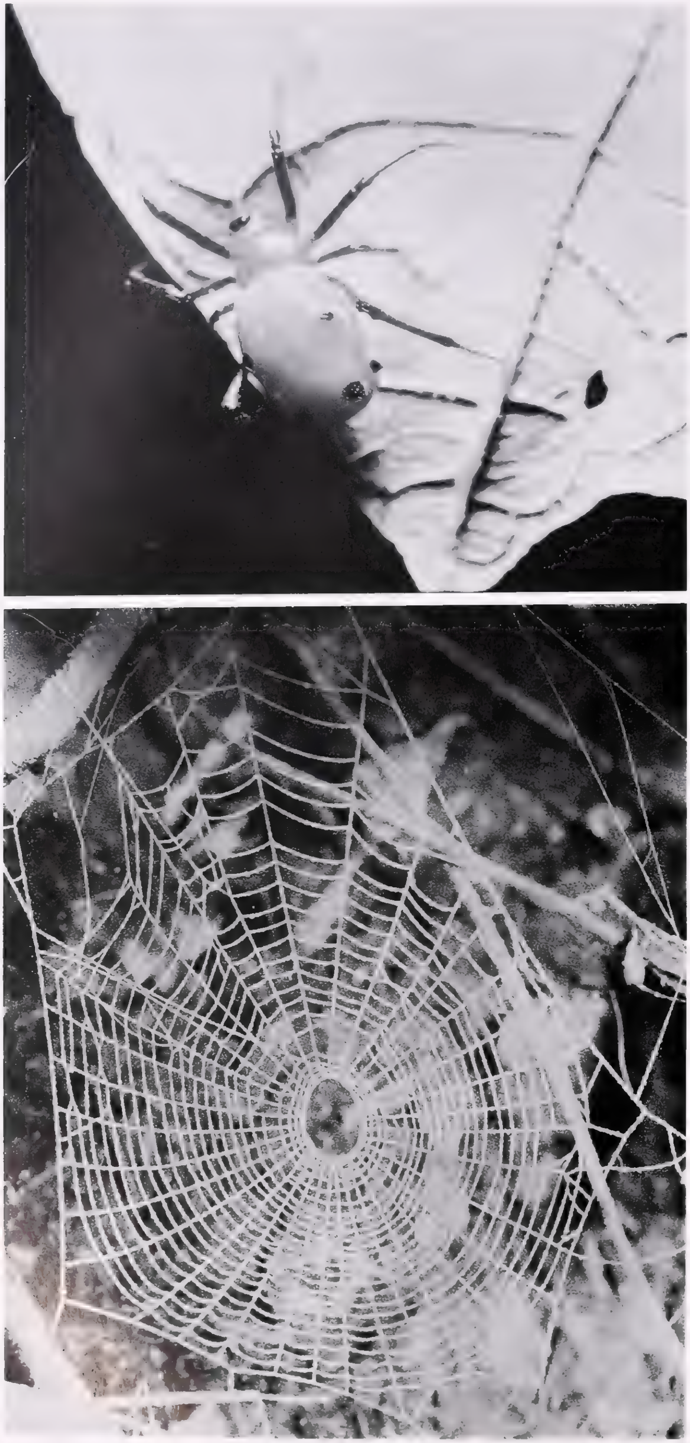
Variation. All species are remarkably similar in coloration, shape, and size (Pl. 2, Figs. 56, 57). Also, the variation of specimens of different species collected in the same area is similar: most South American females have smaller tubercles on the abdomen (Fig. 57) than those from Central America (Fig. 56), and the two specimens collected in Guyana (*P. nigripes* and *P. intus*) have black legs.

Relationship. The long fourth legs and nearly rectangular male abdomen of *Pronous* are characters shared with *Micrathena*; both are believed to be synapomorphies. However, *Micrathena* uses the long fourth legs to hold its abdomen upside down, horizontally, at a right angle to the web, making the sky and leaves the background for the bright dorsal coloration and the ground the background for the dull ventral view. *Pronous*, on the other hand, adopts a resting position more like that of other araneids (Eberhard, personal communication). Thus, the homology of the long legs in the two genera is uncertain.

Natural History. The species makes small vertical webs, about 7 to 10 cm diameter, above leaf litter in forests (personal observations in Panama; Pl. 2). The web has few supporting threads and may catch walking insects and insects flying above ground level (Lubin, 1978). At the slightest disturbance, the spider falls from the web and disappears in leaf litter. Specimens are thus difficult to collect. About half of the available *Pronous* specimens were collected by A. M. Chickering, who laboriously sifted leaf litter.

Distribution. Fourteen species are American, most coming from Mexico and Central America (Map 4). The four species described by Simon (Roewer, 1942: 967) from Asia and Madagascar are probably all misplaced. The holotypes of only two of the four were found in the MNHN. *Pronous laevisternis* Simon, 1908, from Tonkin, the area around Hanoi, Vietnam, and *P. taprobanicus* Simon, 1895, from Ceylon (Sri Lanka), were examined and found to belong to *Hypsosinga*. The first is *H. pygmaea* (Sundevall, 1831), NEW SYNONYMY (see Levi, 1975). Another two, more recently described, *Pronous minutus* Saito, 1939 (in Yaginuma, 1986), and *Pronous tetraspinulus* Yin, Wang, Xie and Peng, 1990 (Platnick, 1993: 462) from China and Japan are probably also misplaced. The fourth legs are much shorter than the first in *P. minutus* (Song, personal communication); *P. minutus* may also be *Hypsosinga*. *Pronous chelifer* Hasselt (1882: 24), from Sumatra, is *Gea spinipes* C. L. Koch, 1843 (Levi, 1983).

Separating Species. Males are readily separated by the structure of their palpi, the shape of the embolus, the median apophysis, conductor, and tegular lobe. Females are difficult to separate: the epigyna of females of different species are similar. The borders of structures in the epigynum are transparent and difficult to delineate. The cleared epigynum showing ducts (cleared in Hoyer's medium) is help-



ful, but the dorsal view of the epigynum (vulva) is less so.

KEY TO FEMALE *PRONOUS*

The terms used in this key are illustrated in Figure 63.

1. Females from South America (Maps 4B, D, F, G) 2

– Females from Mexico or Central America (Maps 4A, B, C, E, F, G) 7

2(1). Epigynum with V-shaped dusky patch (Figs. 63, 131, 135); lateral and posterior overhang of epigynum wide (Figs. 131, 135); in posterior view long axis of opening longitudinal (Figs. 134, 138); South America (Map 4D) .... *tuberculifer*

– Epigynum otherwise (Figs. 98, 107, 117, 122, 127) 3

3(2). Epigynum with posterior median plate narrow ventrally, wider dorsally (at center of Fig. 120); lateral overhang with a pointed projection in ventral view (Fig. 117); Colombia (Map 4G) .... *valle*

– Sides of posterior median plate straight dorsally (Figs. 101, 106, 125, 130) 4

4(3). Anterior lip of epigynum visible in ventral view (Figs. 103, 107, 122, 127) 5

– Anterior lip not visible in ventral view (Fig. 98); Colombia (Map 4F) .... *wixoides*

5(4). Epigynum with anterior lip small (Fig. 127); dusky patches with a pair of round spots (Fig. 127); Guyana (Map 4G) .... *nigripes*

– Epigynum with anterior lip larger (Figs. 103, 107, 122); dusky patches otherwise 6

6(5). Anterior lip swollen in median (Figs. 103, 107); posterior lip curved anteriorly in median (Figs. 103, 107); Costa Rica to Ecuador, Venezuela, northern Brazil (Map 4B) .... *intus*

– Anterior lip not swollen in median (Fig. 122); Colombia (Map 4G) .... *pance*

7(1). Mexico (Maps 4A, C, E) 8

– Honduras to Panama (Maps 4A, B, C, E, F, G) 10

8(7). Epigynum with a median notch (Fig. 71) .... *quintana*

– Epigynum without notch (Figs. 66, 75) 9

9(8). Median area of epigynum with anterior margin of epigynum V-shaped (Fig. 66) .... *beatus*

– Median area of epigynum with margins parallel forming a small bordered longitudinal groove (Fig. 75) .... *felipe*

10(7). Epigynum in ventroposterior view with a transverse, oval median plate having a small median longitudinal ridge (Fig. 114); margin of epigynum rebordered (Fig. 112); Panama (Map 4G) .... *shanus*

– Epigynum otherwise (Figs. 79, 81, 83, 85, 88, 90) 11

11(10). In posterior view, epigynum median plate with wide median split (Fig. 96); Costa Rica (Map 4A) .... *golfito*

– Epigynum otherwise (Figs. 69, 82, 101) 12

12(11). Posterior lips of epigynum almost triangular in shape with a posterior median bulge (Fig. 79); Honduras (Map 4E) .... *lancetilla*

– Epigynum otherwise (Figs. 66, 83, 88, 98) 13

13(12). No distinct anterior lip visible in ventral view (Figs. 66, 98) 14

– Anterior lip visible in ventral view, sometimes only in median area (Figs. 83, 88) 15

14(13). Posterior median plate wider dorsally than ventrally and only barely notched ventrally (at 12 hr in Figs. 68, 69); Costa Rica (Map 4A) .... *beatus*

– Sides of posterior median plate about parallel and with a long median division (Fig. 101); in cleared view with a pair of median wide duct curves (Fig. 99); Panama (Map 4F) .... *wixoides*

15(13). Margin of epigynum in ventral view with a median longitudinal bordered groove (Fig. 83); Costa Rica (Map 4C) .... *peje*

– Epigynum otherwise (Figs. 88, 103, 107) 16

16(15). Ventroposterior view of epigynum with two curved openings, lateral plates constricting median plate; median plate with long groove (Fig. 90); Costa Rica (Map 4A) .... *colon*

– Epigynum otherwise, lateral plates only slightly constricting median plate (Figs. 105, 109); median plate with short ventral split (Figs. 106, 110); Costa Rica to Colombia (Map 4B) .... *intus*

←

Plate 2. *Pronous tuberculifer*, bright orange-red coloration with black patches and dusky legs, total length 5 mm. Web of *Pronous wixoides* about 10 cm wide (lower photo, W. Eberhard).

KEY TO MALE *PRONOUS*

The males of *P. colon*, *P. lancetilla*, and *P. nigripes* are unknown.

1. Outer, upper edge of median apophysis (M in Figs. 64, 65) with a square notch, transverse spine of median apophysis thick (Fig. 97); Costa Rica (Map 4A) …… *golfito*
– Median apophysis without square corner notch (Figs. 64, 70, 74, 116) …… 2
2(1). Distal, outer edge of median apophysis with an outer spine and an elongate notch between it and edge (Figs. 70, 74, 116, at 3 hr in Fig. 70); Mexico to Panama (Map 4) …… 3
– Outer edge of median apophysis entire (Figs. 64, 78, 87, 121) …… 5
3(2). Embolus (E in Figs. 64, 65) a semicircular disk (Fig. 70); Mexico, Costa Rica (Map 4A) …… *beatus*
– Embolus filamentous (Figs. 74, 116) …… 4
4(3). Transverse spine of median apophysis close to its "upper" edge (Fig. 74); Mexico (Map 4C) …… *quintana*
– Transverse spine of median apophysis in middle of median apophysis (Fig. 116); Panama (Map 4G) …… *shanus*
5(2). Embolus a long fine thread, whose length (if stretched) is longer than diameter of palpus (Fig. 102); Panama to Colombia, Ecuador (Map 4F) …… *wixoides*
– Embolus otherwise (Figs. 87, 121, 139) …… 6
6(5). Embolus a semicircular disk (partly transparent) (Fig. 139); South America (Map 4D) …… *tuberculifer*
– Embolus more or less filamentous (Figs. 78, 111, 121, 126) …… 7
7(6). Spine of median apophysis annulate (Fig. 121); Colombia (Map 4G) …… *valle*
– Spine of median apophysis smooth (Figs. 87, 97, 126) …… 8
8(7). Median apophysis pointed distally "above" spine (at 3 hr in Fig. 78); Mexico (Map 4E) …… *felipe*
– Median apophysis rounded "above" spine (Figs. 87, 111, 126) …… 9
9(8). Embolus thick, wider than opening of notch, the "upper" area enclosed by embolus (Fig. 87); Costa Rica (Map 4C) …… *peje*
– Embolus a finer thread (Figs. 111, 116) …… 10
10(9). Embolus a fine thread (Fig. 126); tegulum lobe truncate (at 12 hr in Fig. 126); Colombia (Map 4G) …… *pance*
– Embolus thick, tegulum lobe rounded (Fig. 111); Costa Rica to Ecuador (Map 4B) …… *intus*

Pronous beatus (O. P.-Cambridge)
Figures 66–70; Map 4A

Paphlagon beatus O. P.-Cambridge, 1893: 117, pl. 14, fig. 10, ♀. Female from Teapa [Tabasco State], Mexico, in BMNH, lost. Erroneously synonymized with *P. tuberculifer* by O. P.-Cambridge (1898: 281).

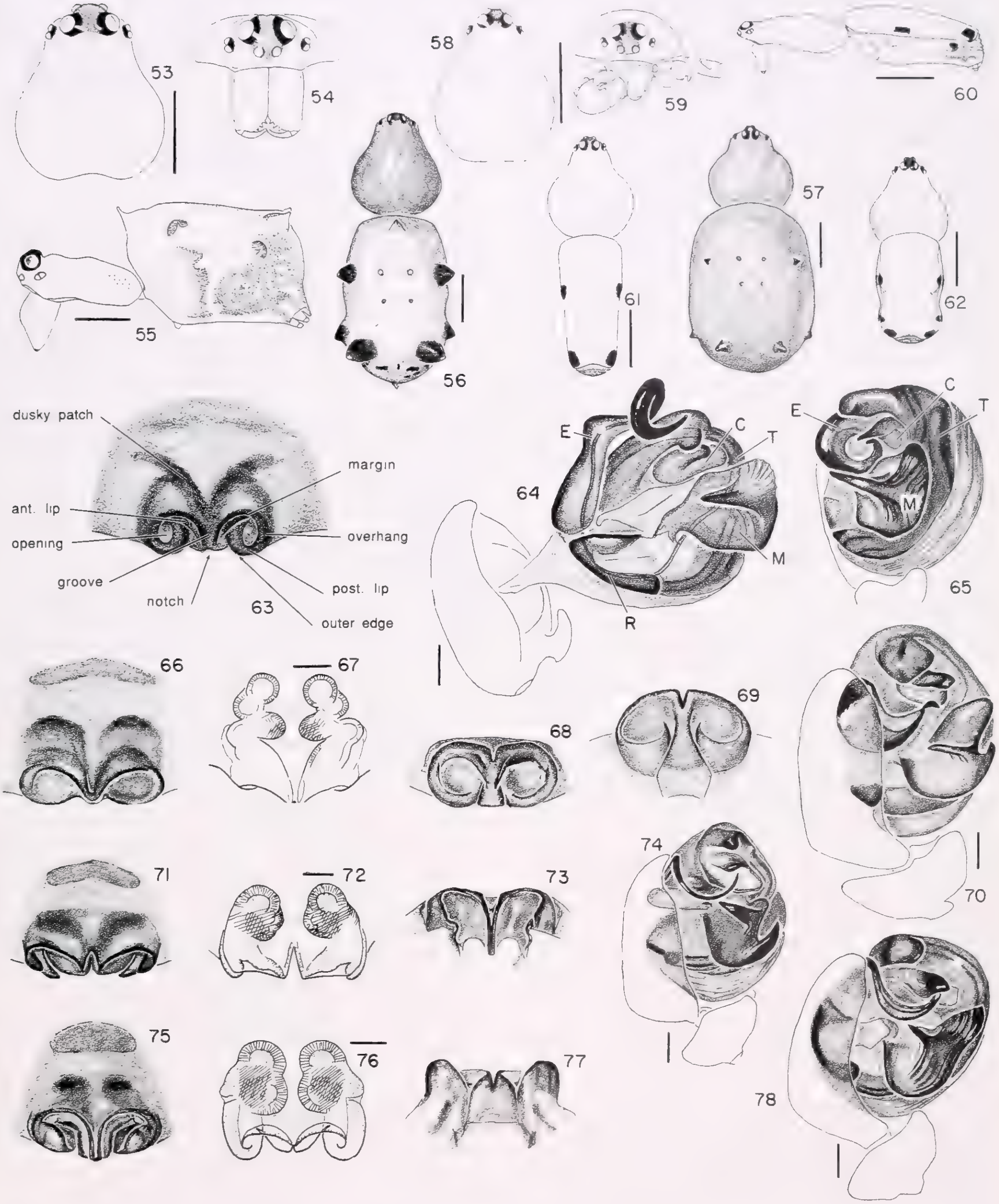
Note. The holotype female, without male of *P. beatus*, could not be found in the BMNH. Cambridge later received more specimens and cited *P. beatus* as a synonym of *P. tuberculatus* (in error). These later females, together with males, were found in the BMNH to be *P. quintana*. There are two specimens in the HECO collection, one male and one female. The only label in the vial was made out for my loan, with my loan number, the *Paphlagon beatus* name, and locality, Teapa. However, the specimens also belonged to *P. quintana*. From O. P.-Cambridge's illustration, it is clear that the Hope Collection specimens cannot be the types. This was verified by a letter from I. Lansbury, stating that the holotype should be in the Natural History Museum in London. I suspect that when O. P.-Cambridge synonymized *Paphlagon beatus* (erroneously) the type label of *P. beatus* was changed, although it will always remain the type of this name, whether synonymized with another name or not.

Description. Female from Huehuetan.

→

Figures 53–65. Morphology of *Pronous*. 53–57, 63, female. 53, carapace. 54, eye region and chelicerae. 55, lateral. 56, 57, dorsal. 63, epigynum, diagrammatic. 58–62, 64, 65, male. 58, carapace. 59, eye region, chelicerae, right palpus, left first coxa and second trochanter, and proximal part of femur. 60, lateral. 61, 62, dorsal. 63, epigynum, diagrammatic. 64, 65, left male palpus. 64, palpus pulled apart. 65, ventral. 53, 54, 56, 58–61, 64, 65, *P. intus*. 55, *P. wixoides*. 57, 62, *P. tuberculifer*.

Figures 66–70. *Pronous beatus* (O. P.-Cambridge). 66–69, female epigynum. 66, ventral. 67, ventral, cleared. 68, ventroposterior. 69, posterior. 70, male left palpus, mesal.


53
54
58
59
60
55
56
61
57
62
dusky patch
margin
ant. lip
opening
overhang
groove
notch
post. lip
63
outer edge
64
E
C
T
M
R
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E
C
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Figures 71–74. *P. quintana* n. sp. 71–73, female epigynum. 71, ventral. 72, ventral, cleared. 73, posterior. 74, male palpus.

Figures 75–78. *P. felipe* n. sp. 75–77, female epigynum. 75, ventral. 76, ventral, cleared. 77, posterior. 78, male palpus.

Abbreviations. C, conductor. E, embolus. M, median apophysis. R, radix. T, tegulum.

Scale lines. 1.0 mm, genitalia 0.1 mm.

Total length 4.5 mm. Carapace 2.0 mm long, 1.7 wide, 1.1 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.2, metatarsus 1.7, tarsus 0.9. Second patella and tibia 1.9 mm, third 1.5. Fourth femur 2.9 mm, patella and tibia 2.8, metatarsus 2.1, tarsus 0.7.

Male from Huehuetan. Abdomen elongate, intermediate between *P. intus* (Fig. 61) and *P. tuberculifer* (Fig. 62). Total length 4.3 mm. Carapace 1.9 mm long, 1.6 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.0, metatarsus 1.8, tarsus 0.9. Second patella and tibia 1.7 mm, third 1.3. Fourth femur 2.7 mm, patella and tibia 2.4, metatarsus 2.2, tarsus 0.9.

Note. Males and females were collected together.

Variation. Total length of females 4.5 to 4.8 mm, males 4.3 to 4.7. The specimens illustrated came from near Huehuetán, Chiapas.

Diagnosis. The epigynum of the female differs from *P. quintana* (Figs. 71–73) in lacking a median notch in ventral view (Fig. 66). In posterior view the epigynum differs from that of *P. felipe* (Fig. 77) by having a median plate that is narrow ventrally and widest dorsally (Fig. 69). The male has a round semicircular embolus (Fig. 70), as does the South American *P. tuberculifer* (Fig. 139). The outer edge of the median apophysis has a notch separating off an outer spine (Fig. 70); the transverse spine has nearly parallel sides and, unlike *P. quintana* (Fig. 74), a large lobe above (Fig. 70).

Distribution. Mexico, perhaps to Costa Rica (Map 4A).

Specimens Examined. MEXICO *Nayarit:* San Blas, 4–5 Aug. 1947, 1♂ (B. Malkin, C., M. Goodnight, AMNH). *Jalisco:* Río Pitillal, Playa Grande, 5 km E Puerto Mallarta, 12 July 1989, 1♀; 8 July 1992, 3♀ (R. West, MCZ); Chamela, Sept. 1989, 1♀ (W. Eberhard, MCZ). *Oaxaca:* 3.2 km SE Niltepec, 16°32′N, 94°33′W, 16 Aug. 1966, 1♀ (J., W. Ivie, AMNH); 8 km E Tapanatepec, 230 m, 28 Aug. 1967, 1♀ (R. E. Leech, REL). *Chiapas:* Esquintla, 1♀ (Crawford, MCZ); 10 km N Arriaga, 305 m, 23 Aug. 1972, 1♀ (C. Mullinex, K. Lucas, CAS); Finca Santa Marta, nr. Huehuetán, 31 July–1 Aug. 1950, 5♀, 2♂ (C., M. Goodnight, AMNH); 16 km SE Tierra y Libertad [?], 1,000 m, 23 Aug. 1972, 1♂ (C. Mullinex, K. Lucas, CAS). COSTA RICA *Cartago:* El Cedral, Navarro Orosi-Cartago, 29 Nov. 1979, 1♀, doubtful determination (C. E. Valerio, MZCR).

Pronous quintana new species
Figures 71–74; Map 4C

Pronous tuberculatus:—O. P.-Cambridge, 1898: 281, pl. 36, fig. 13, ♂ (misidentification).

Holotype. Male holotype, male paratype, and two female paratypes from 31 km NE of Felipe Carrillo Puerto, on Highway 307 toward Tulum, ca. 19°48′N, 87°52′W, Quintana Roo, Mexico, 17 July 1983 (W. Maddison, R. S. Anderson), in MCZ. The specific name is a noun in apposition after the locality.

Note. Cambridge specimens (1898, but not 1893), both females and males, are all *P. quintana*.

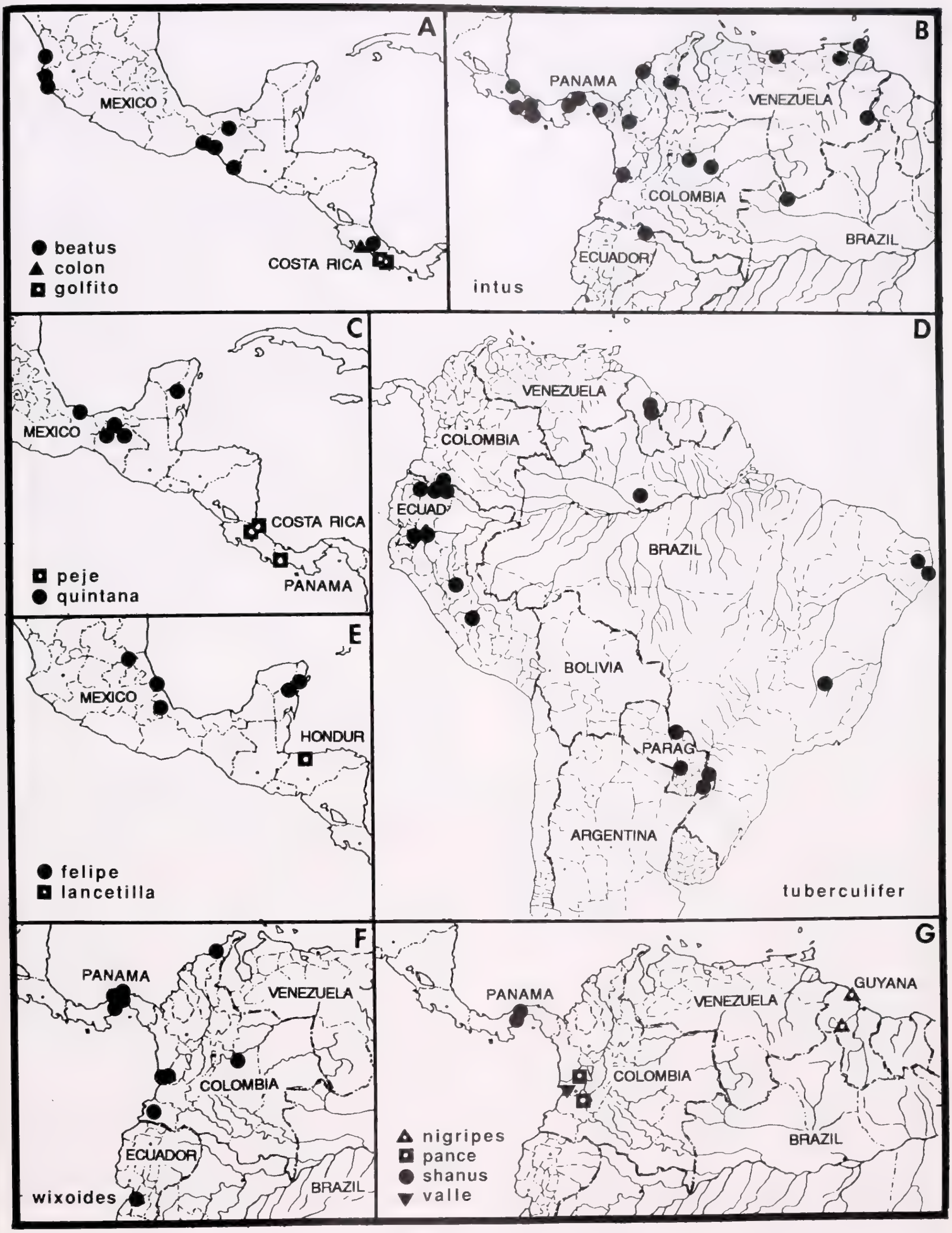
Description. Female paratype. Coloration as in other species, legs dark orange, dusky marks on sides of carapace. Total length 5.4 mm. Carapace 2.1 mm long, 1.9 wide, 1.1 wide behind lateral eyes. First femur 2.0 mm, patella and tibia 1.9, metatarsus 1.7, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.5. Fourth femur 2.8 mm, patella and tibia 2.7, metatarsus 2.1, tarsus 0.9.

Male holotype. Abdomen relatively short, intermediate between *P. intus* (Fig. 61) and *P. tuberculifer* (Fig. 62), with soft, bulging sides. Black patches small. Total length 4.3 mm. Carapace 1.9 mm long, 1.5 wide, 0.7 behind lateral eyes. First femur 1.2 mm, patella and tibia 1.9, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.5 mm, third 1.1. Fourth femur 2.1 mm, patella and tibia 2.0, metatarsus 1.6, tarsus 0.6.

Note. Males and females were matched on the basis of two collections that included both sexes.

Variation. Total length of females 3.6 to 5.4 mm, males 3.6 to 4.3. The illustration of the male palpus (Fig. 74) was made from the holotype; the female (Figs. 71–73) was drawn from a specimen from near La Palma, Veracruz.

Diagnosis. The female differs from other Mexican species by having a deep


A
MEXICO
COSTA RICA
● beatus
▲ colon
◘ golfito
B
PANAMA
VENEZUELA
COLOMBIA
ECUADOR
BRAZIL
intus
C
MEXICO
COSTA RICA
PANAMA
◘ peje
● quintana
D
VENEZUELA
COLOMBIA
ECUAD
BRAZIL
BOLIVIA
PARAG
ARGENTINA
tuberculifer
E
MEXICO
HONDUR
● felipe
◘ lancetilla
F
PANAMA
VENEZUELA
COLOMBIA
ECUADOR
BRAZIL
wixoides
G
PANAMA
VENEZUELA
GUYANA
COLOMBIA
BRAZIL
△ nigripes
◘ pance
● shanus
▼ valle

Map 4. Distribution of *Pronous* species.

median notch on the posterior margin of the epigynum (Fig. 71). The male differs by having a short, thread-like embolus and by the median apophysis having a lateral notch, separating off an outer spine (Fig. 74).

Natural History. The male holotype was found hanging by a thread from vegetation. The female was found close to the ground in forest, along the edge of a road in a small orb web with its hub open.

Distribution. Southern Mexico (Map 4C).

Specimens Examined. MEXICO *Veracruz:* Estación de Biología Tropical "Los Tuxtlas", nr. La Palma, 15 km N Catemaco, ca. 18°36′N, 95°07′W, 1, 2 Aug. 1983, 1♀, 1♂ (W. Maddison, AMNH ex MCZ); Aug. 1986, 2♀ (W. Eberhard 3363, 3366, MCZ). *Chiapas:* Pichucalco, 17 July 1947, 1♀ (C., M. Goodnight, AMNH); Palenque, July 1981, 1♀ (C. Gold, CAS). *Tabasco:* Teapa, 2♀, 2♂ (BMNH, HECO).

Pronous felipe new species
Figures 75–78; Map 4E

Holotype. Male holotype from 31 km NE of Felipe Carrillo Puerto on Highway 307 to Tulum, 19°48′N, 87°52′W, Quintana Roo, Mexico, 17 July 1983 (W. Maddison, R. S. Anderson), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female from Coba Ruins, Quintana Roo. Total length 4.9 mm. Carapace 2.2 mm long, 1.9 wide, behind lateral eyes 0.9 wide. First femur 2.1 mm, patella and tibia 2.1, metatarsus 1.6, tarsus 0.7. Second patella and tibia 2.0 mm, third 1.6. Fourth femur 2.9 mm, patella and tibia 2.6, metatarsus 2.3, tarsus 0.9.

Male holotype. Coloration light, abdomen intermediate in length between *P. intus* (Fig. 61) and *P. tuberculifer* (Fig. 62). Posterior dorsal black patches small. Posterior dorsal tubercles distinct. Total length 4.3 mm. Carapace 1.8 mm long, 1.5 wide, 0.7 wide behind lateral eyes. First femur 1.7 mm, patella and tibia 1.7, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.4 mm, third 1.1. Fourth femur 2.1 mm, patella and tibia 2.0, metatarsus 1.7, tarsus 0.7.

Note. Males and females were matched by elimination, both being the third Mexican species after males and females of the other two species were associated.

Variation. Total length of females 4.9 mm, males 3.8 to 4.3. The illustrations were made from specimens from the Coba Ruins.

Diagnosis. The female differs from *P. beatus* (Figs. 66–69) and *P. quintana* (Figs. 71–73) by having a median longitudinal bordered groove in ventral view of the epigynum (Fig. 75). In the male, the palpus has a short embolus enclosing a shallow notch, and the median apophysis has a distal, "upper" point and no outer spine (Fig. 78).

Distribution. Eastern Mexico (Map 4E).

Specimens Examined. MEXICO *San Luis Potosí:* Tamazunchale, 6, 7 July 1941, 1♀ (L. I. Davis, AMNH); 19 April 1963, 1♀ (W. J. Gertsch, W. Ivie, AMNH); 26 June 1947, 1♀ (B. Malkin, AMNH). *Veracruz:* Cordoba, 20–27 July 1976, 1♀ (C. H., H. Seevers, AMNH); Tecolutla, 13 Oct. 1947, 1♂ (H. M. Wagner, AMNH). *Quintana Roo:* Coba Ruins, ca. 20°30′N, 87°42′W, 18 July 1983, 1♀ (W. Maddison, MCZ).

Pronous lancetilla new species
Figures 79–82; Map 4E

Holotype. Female holotype from Lancetilla, Depto. Atlantida, Honduras, July 1929 (A. M. Chickering), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female holotype. Total length 4.4 mm. Carapace 2.0 mm long, 1.6 wide, 0.9 behind lateral eyes. First femur 1.9 mm, patella and tibia 1.9, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.7 mm, third 1.2. Fourth femur 2.5 mm, patella and tibia 2.1, metatarsus 1.8, tarsus 0.8.

Diagnosis. Pronous lancetilla differs from *P. golfito* (Figs. 93–96) and other *Pronous* by having in ventral view of the epigynum a semicircular anterior margin, no anterior lips visible, and a transverse posterior lip forming a triangle on each side (Fig. 79). In posterior view, the median plate lacks the deep split (Fig. 82) present in *P. golfito* (Fig. 96). The internal genitalia are simple (Fig. 80) as in *P. golfito* (Fig. 94).

Pronous peje new species
Figures 83–87; Map 4C

Holotype. Male holotype from La Selva, near Puerto Viejo, Heredia Prov., Costa Rica, 1–3 Dec. 1981 (J. Coddington), in MCZ. The specific name is a noun in apposition after the name of a stream near the type locality.

Description. Female paratype. Coloration as in other species but legs brown. Total length 4.3 mm. Carapace 1.9 mm long, 1.5 wide, 0.9 behind lateral eyes. First femur 1.9 mm, patella and tibia 1.9, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.6 mm, third 1.3. Fourth femur 2.4 mm, patella and tibia 2.1, metatarsus 1.8, tarsus 0.7.

Male holotype. Coloration as in other species but legs black. Abdomen elongate as in *P. intus* (Fig. 61). Total length 3.2 mm. Carapace 1.5 mm long, 1.1 wide, 0.6 behind lateral eyes. First femur 1.4 mm, patella and tibia 1.3, metatarsus 1.0, tarsus 0.6. Second patella and tibia 1.1 mm, third 0.8. Fourth femur 1.6 mm, patella and tibia 1.4, metatarsus 1.2, tarsus 0.6.

Note. Males and females were collected at the same locality.

Variation. Total length of females 4.1 to 4.4 mm. The illustrations (Figs. 83–87) were made from the holotype and paratype.

Diagnosis. Pronous peje differs from other species found in Costa Rica by the large circular margins of the epigynum and the presence of a bordered median longitudinal groove with parallel sides (Fig. 83). The embolus of the male encloses a small space with a diameter smaller than the diameter of the embolus at its widest (Fig. 87).

Natural History. A female from Limón Province was collected in a wet forest. Another from La Selva was collected with six unwrapped eggs.

Specimens Examined. COSTA RICA *Heredia:* La Selva, nr. Puerto Viejo, Feb. 1986, 2♀ paratypes (W. Eberhard, MCZ). *Limón:* Cerro Tortuguero, Tortuguero, 110 m, 6 Jan. 1986, 1♀ (J. Coddington, USNM). PANAMA *Chiriquí:* La Fortuna, 5 Apr. 1984, 2♀ (W. Eberhard, MCZ).

Pronous colon new species
Figures 88–92; Map 4A

Holotype. Female holotype from near Villa Colón, San José Prov., Costa Rica, Nov. 1990 (W. Eberhard), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female holotype. Total length 4.8 mm. Carapace 2.1 mm long, 1.7 wide, 1.1 wide behind lateral eyes. First femur 2.3 mm, patella and tibia 2.3, metatarsus 1.8, tarsus 0.9. Second patella and tibia 2.1 mm, third 1.6. Fourth femur 2.7 mm, patella and tibia 2.7, metatarsus 2.1, tarsus 1.0.

Diagnosis. Pronous colon differs from *P. golfito* (Fig. 93) and *P. peje* (Fig. 83) by the wide overhangs and almost circular openings on each side of the anterior lip as seen in the ventral view of the epigynum (Fig. 88). In posterior view, the epigynum of this species differs from others by having the median plate constricted by a shallow lobe of the lateral plates (Figs. 90, 91).

Pronous golfito new species
Figures 93–97; Map 4A

Holotype. Male from 3 km northeast of Golfito, 100 m, collected on and under logs, Puntarenas Prov., Costa Rica, 22, 23 May 1987 (D. Ubick), in CAS. The specific name is a noun in apposition after the locality.

Description. Female paratype. Total length 5.0 mm. Carapace 2.1 mm long, 1.7 wide, 0.8 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.1, metatarsus 1.5, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.4. Fourth femur 2.7 mm, patella and tibia 2.5, metatarsus 2.0, tarsus 0.8.

Male holotype. Abdomen elongate as in *P. intus* (Fig. 61). Total length 3.8 mm. Carapace 1.7 mm long, 1.3 wide, 0.6 behind lateral eyes. First femur 1.9 mm, patella and tibia 1.8, metatarsus 1.3, tarsus

0.7. Second patella and tibia 1.4 mm, third 1.1. Fourth femur 2.0 mm, patella and tibia 1.9, metatarsus 1.6, tarsus 0.7.

Note. Males and females were collected in the same area.

Variation. Total length of females 4.8 to 5.0 mm. The illustrations (Figs. 93–97) were made from the holotype and paratype.

Diagnosis. The female differs from *P. wixoides* by having only one pair of dark patches between seminal receptacles and anterior margin of the epigynum (Fig. 93) and by having the ventroposterior openings narrowly oval (Fig. 95). In posterior view it differs by the wide median notch (Fig. 96). The male differs from all others by the small nick on the "upper right" corner of the median apophysis of the left palpus (Fig. 97).

Natural History. Specimens were collected in forest vegetation.

Paratypes. COSTA RICA *Puntarenas:* Golfito, 24 July 1981, 2♀ paratypes (G. B. Edwards, FSCA); 24 July 1981, 1♀ (B. K. Dozier, FSCA).

Specimens Examined. COSTA RICA *Puntarenas:* Osa Peninsula, 4 km SW Rincon, 8–12 Mar. 1967, 1♀ (Organiz. for Tropical Studies, MCZ).

Pronous wixoides (Chamberlin and Ivie) new combination
Figures 55, 98–102; Map 4F

Pronous beatus:—Banks, 1929: 96 (misidentification).

Zigana wixoides Chamberlin and Ivie, 1936: 53, pl. 16, figs. 137, 138, ♀. A female lectotype, here designated, and four female and one immature male paralectotypes (all type specimens in poor condition), from Barro Colorado Island [Lago Gatún, Panamá Prov.], Panama, in AMNH, examined. Roewer, 1942: 883. Bonnet, 1959: 4962.

Description. Female from Barro Colorado Island, Panama. Total length 3.7 mm. Carapace 1.6 mm long, 1.4 wide, 0.9 behind lateral eyes. First femur 1.7 mm, patella and tibia 1.8, metatarsus 1.3, tarsus 0.6. Second patella and tibia 1.5 mm, third 1.1. Fourth femur 2.1 mm, patella and tibia 2.0, metatarsus 1.7, tarsus 0.7.

Male from Barro Colorado Island, Panama. Abdomen relatively short (Fig. 62). Total length 3.6 mm. Carapace 1.6 mm long, 1.3 wide, eyes 0.6 behind lateral eyes. First femur 1.7 mm, patella and tibia 1.6, metatarsus 1.4, tarsus 0.7. Second patella and tibia 1.3 mm, third 1.0. Fourth femur 1.8 mm, patella and tibia 1.8, metatarsus 1.5, tarsus 0.6.

Note. The sexes were matched on the basis of the connecting ducts in the epigynum of the female (Fig. 99), which correspond to the long embolus of the male. These ducts are longer in *P. wixoides* than in *P. intus* and *P. shanus.* The distribution of male specimens from Panama to Ecuador matches that of the females (Map 4F).

Variation. One female individual of doubtful determination from Serra Nueva Granada, northern Colombia, has the abdomen almost completely black. Total length of females 3.6 to 5.0 mm, males 3.4 to 4.1. The illustrations (Figs. 98–102) were

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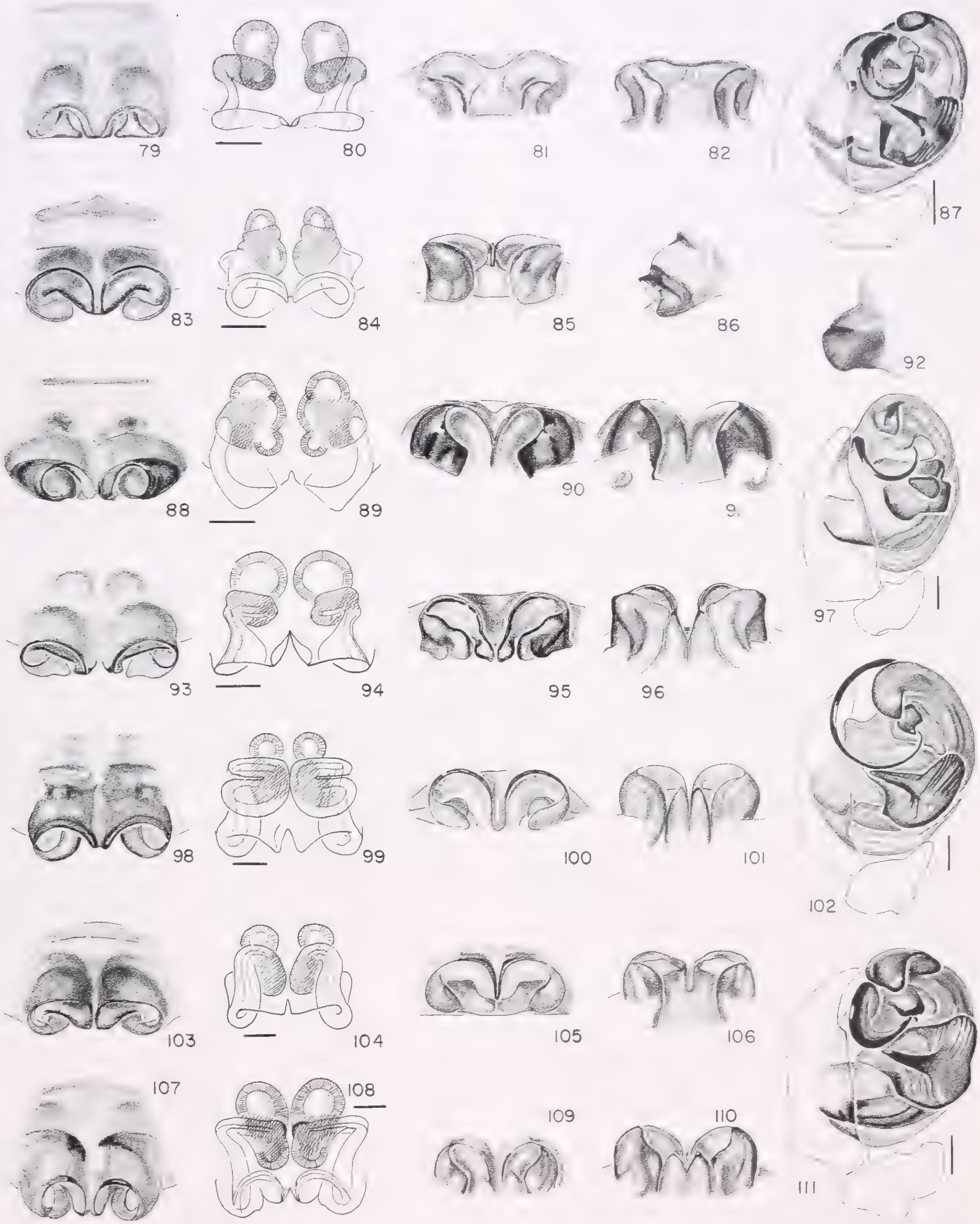
Figures 79–82. *Pronous lancetilla* n. sp., female epigynum. 79, ventral. 80, ventral, cleared. 81, ventroposterior. 82, posterior.

Figures 83–87. *P. peje* n. sp. 83–86, female epigynum. 83, ventral. 84, ventral, cleared. 85, posterior. 86, lateral. 87, male left palpus.

Figures 88–92. *P. colon* n. sp. 88–91, female epigynum. 88, ventral. 89, ventral, cleared. 90, ventroposterior. 91, posterior. 92, lateral.

Figures 93–97. *P. golfito* n. sp. 93–96, female epigynum. 93, ventral. 94, ventral, cleared. 95, ventroposterior. 96, posterior. 97, male palpus.

Figures 98–102. *P. wixoides* (Chamberlin and Ivie). 98–101, female epigynum. 98, ventral. 99, ventral, cleared. 100, ventroposterior. 101, posterior. 102, male palpus.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Figures 103–111. *P. intus* n. sp. 103–110, female epigynum. 103, 107, ventral. 104, 108, ventral, cleared. 105, 109, ventro-posterior. 106, 110, posterior. 111, male palpus. 103–106, 111, (Panama). 107–110, (Ecuador).

Scale lines. 0.1 mm.

made from specimens from Barro Colorado Island, Panama.

Diagnosis. This species is slightly smaller than *P. intus* and *P. shanus.* The female *Pronous wixoides* differs from related Central American species by having four (rather than two) dark patches on the anterior of the epigynum. The anterior pair of patches are in the shape of a tranverse line (Fig. 98). The internal genitalia differ by having the duct loops facing each other in the median (Fig. 99). The female is difficult to separate from *P. intus,* which has an anterior lip showing in the median (Figs. 103, 107); *P. wixoides* does not (Fig. 98). The epigynum may have to be cleared for diagnosis. In contrast, the male differs from all other species by having a much longer filamentous embolus (Fig. 102).

Natural History. Specimens were collected in second growth forest near Buenaventura, Colombia.

Distribution. Panama, Colombia to southern Ecuador (Map 4F).

Specimens Examined. PANAMA *Coclé:* El Valle, Jan. 1936, 2♀ (J. A. Griswold, MCZ); July 1936, 1♂ (A. M. Chickering, MCZ); Oct. 1954, 1♀ (W. E. Lundy, AMNH). *Colón:* Fort Davis, 14 Aug. 1936, 1♀ (A. M. Chickering, MCZ); Porto Bello [Portobelo], 12 Aug. 1936, 1♀ (A. M. Chickering, MCZ). *Panamá:* Barro Colorado Island, very common. COLOMBIA *Magdalena:* Serra Nueva Granada, S. N. de Santa Marta, 1,311 m, 24 May 1975, 1♀ (doubtful determ., J. A. Kochalka, JAK). *Meta:* ca. 15 km SW Puerto Lopez, Hacienda Mozambique, 200 m, 1♀ (W. Eberhard 1748, MCZ). *Valle:* Hydroelectric Dam on Río Anchicayá, 400 m, 1978, 1♂ (W. Eberhard, MCZ); no date, 1♀ (W. Eberhard, 851, MCZ); 1975, 1♀ (W. Eberhard, MCZ); 28 km E Buenaventura, 20 Jan. 1970, 1♀ (W. Eberhard 247, MCZ). *Nariño:* nr. Barbacoas, 20 m, 20 Mar. 1974, 1♀ (W. Eberhard 750, MCZ). ECUADOR "Peru, Palmal" [Palmal, Ecuador, see Palmales, 03°41′S, 80°00′W, El Oro Prov., 93 m (Stephens and Traylor, 1983)], 1♂ (K. Jelski, J. Sztolcman, PAN).

Pronous intus new species

Figures 53, 54, 56, 58–61, 64, 65, 103–111; Map 4B

Holotype. Male holotype and three female paratypes from Barro Colorado Island, Lago Gatún, Prov. Panamá, Panama, June 1950 (A. M. Chickering), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female paratype. Total length 4.7 mm. Carapace 1.9 mm long, 1.6 wide, 1.1 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.1, metatarsus 1.5, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.3. Fourth femur 2.5 mm, patella and tibia 2.5, metatarsus 1.8, tarsus 0.7.

Male holotype. Abdomen elongate (Fig. 61). Total length 4.0 mm. Carapace 1.9 mm long, 1.5 wide, 0.7 behind lateral eyes. First femur 1.8 mm, patella and tibia 1.9, metatarsus 1.4, tarsus 0.7. Second patella and tibia 1.4 mm, third 1.2. Fourth femur 2.0, patella and tibia 1.9, metatarsus 1.7, tarsus 0.7.

Note. Males and females were matched on the basis of their distributions: both have been found from Costa Rica to northern South America. Also, clearing the epigynum of *P. intus* reveals a shorter duct than in *P. wixoides,* corresponding to a shorter embolus in the male palpus.

Variation. The abdomen of a male from Trinidad is shorter than that of other specimens. Total length of females 4.6 to 5.6 mm, males 3.5 to 4.7. Figures 53, 54, 56, 58–61, 103–106, and 111 were made from specimens from Barro Colorado Island, Panama, and Figures 107–110 from Ecuadorean specimens.

Diagnosis. In ventral view the openings of the epigynum have a wider anterior sclerotized lip at the median (Figs. 103, 107) than has *P. wixoides* (Fig. 98), and when cleared, the connecting ducts appear shorter (Figs. 104, 108) than those of *P. wixoides* (Fig. 99). The male palpus has a median apophysis (Fig. 111) as in *P. wixoides* but, unlike *P. wixoides* (Fig. 102), has a shorter, thicker embolus, lightly colored on the inside (Fig. 111).

Natural History. Specimens have been found in premontane forest and by sweeping meadows in Curumani, Colombia. A male was collected in a pitfall trap near Fortuna, Panama. A male from Luepa, Venezuela, came from a Malaise trap in cloud forest.

Distribution. Costa Rica to Venezuela

and Ecuador, northern Amazonas State, Brazil (Map 4B).

Paratypes. PANAMA *Panamá:* Barro Colorado Island, 16–20 July 1924, 1♀ (N. Banks); July 1934, 6♀; Jan. 1936, 4♀; June 1936; 1 ♀; July 1936; 1♂ (USNM ex MCZ); June 1939, 1♀, 1♂; July 1939, 1♂; Aug. 1939, 5♀; Sept. 1939, 2♀, 2♂; July 1950, 17♀, 2♂; Aug. 1950, 3♀; July 1954, 9♀, 2♂; Aug. 1954, 1♂; Jan. 1958, 8♀, 5♂; Feb. 1958. 16♂, 36♀ (MCZ, 1♂ in AMNH ex MCZ) (all A. M. Chickering, MCZ); 2♀ (K. W. Cooper, AMNH); Nov.–Dec. 1939, 1♀ (G. C. Wood, AMNH).

Specimens Examined. COSTA RICA *Limón:* Bataan [Batán], 16 June 1951, 1♀ (O. L. Cartwright, USNM). *Puntarenas:* Golfito, 16 July 1981, 1♂ (B. K. Dozier, FSCA); Osa Peninsula, Sirena, 10 m, Feb. 1984, 1♂ (W. Eberhard, MCZ). PANAMA *Bocas del Toro:* Fortuna, Chiriquí Grande Road, 8°47′N, 82°11′W, 16–18 July 1987, 1♂ (D. Olson, MCZ). *Chiriquí:* David, 26 Nov. 1975, 1♀ (D. Quintero, MCZ). *Coclé:* Valle, July 1936, 1♂ (A. M. Chickering, MCZ). *Panamá:* Summit, Sept. 1946, 1♀ (N. L. H. Krauss, AMNH); Gamboa, Jan. 1958, 1♀, 1♂ (A. M. Chickering, MCZ); Forest Reserve, 28 July 1954, 1♂ (A. M. Chickering, MCZ). *Darién:* Villa Darién, 12–18 Feb. 1984, 1♂ (M. N. García, MIUP). WEST INDIES *Trinidad:* nr. Port of Spain, 1913, 2♂ (R. Thaxter, MCZ). VENEZUELA *Monagas:* Caripito, Mar. 1942, 1♀ (W. Beebe, AMNH). *Bolívar:* 10 km N Luepa, Gran Sabana, 26 June–11 July 1987, 1,500 m, 1♂ (S., J. Peck, AMNH). *Distríto Federal:* "La Moka" [probably a villa near Caracas; H. Enghoff, personal communication], 1891, 1♀ (ZMK). COLOMBIA *Bolívar:* Cartagena, 21 Dec. 1964, 1♀ (P. R. Craig, CAS). *Cesár:* Curumani, 22 July 1968, 1♂ (B. Malkin, AMNH). *Meta:* ca. 20 km N Río Muco, ca. 20 km S El Porvenir, Finca Chenevo, 170 m, no date, 1♂ (W. Eberhard, MCZ); 15 km SW Puerto Lopez, 200 m, 1972, 1♀ (W. Eberhard, MCZ). *Antioquia:* Cancheras, Mutatá, July 1963, 1♂ (P. B. Schneble, MCZ). *Valle:* 50 km S Buenaventura, Mar. 1973, 2♀ (W. Eberhard, MCZ). ECUADOR *Sucumbíos:* bridge over Río Cuyabeno, on road betw. Tarapoa & Tipishca, 00°01′S, 76°18′W, 25–30 June 1988, 1♀, 1♂ (W. Maddison, MCZ). BRAZIL *Amazonas:* Parque Nacional do Pico da Neblina, 5 Oct. 1990, 1♂ (A. A. Lise, MCP).

Pronous shanus new species
Figures 112–116; Map 4G

Holotype. Male holotype and three female paratypes from Barro Colorado Island, Gatun Lake, Panamá Prov., Panama, June 1950 (A. M. Chickering), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female paratype. Total length 5.0 mm. Carapace 2.0 mm long, 1.8 wide, 0.9 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.2, metatarsus 1.7, tarsus 0.8. Second patella and tibia 2.0 mm, third 1.4. Fourth femur 2.8 mm, patella and tibia 2.6, metatarsus 2.1, tarsus 0.9.

Male holotype. Abdomen elongate as in *P. intus* (Fig. 61). Total length 4.1 mm. Carapace 1.8 mm long, 1.4 wide, 0.6 behind lateral eyes. First femur 2.1 mm, patella and tibia 2.0, metatarsus 1.5, tarsus 0.7. Second patella and tibia 1.5 mm, third 1.3. Fourth femur 2.2 mm, patella and tibia 2.1, metatarsus 1.8, tarsus 0.7.

Note. Males and females were matched on the basis of similar geographical distribution and because both male and female genitalia differed strongly from genitalia of other species of *Pronous.* (Females have been collected with males of the other two Panamanian species, *P. wixoides* and *P. intus.*)

Variation. Some females have the venter and sides of the abdomen black. Total length of females 4.3 to 5.6 mm, males 3.8 to 4.8. The illustrations (Figs. 112–116) were made from the holotype and paratypes.

Diagnosis. Females are easily separated from other species by the rebordered margin of the epigynum (Fig. 112) and, in ventroposterior view, by the transverse, oval median plate having a slight median, longitudinal ridge (Fig. 114). The male differs from the other two sympatric species, *P. intus* and *P. wixoides,* by having a short, thin embolus and the median apophysis with a narrow transverse spine as well as an outer spine at a right angle to the first (at 4 hr in Fig. 116). There is a narrow notch between the outer spine and the median apophysis, best seen in a more median view of the palpus.

Distribution. Panama Canal area (Map 4G).

Paratypes. PANAMA *Panamá:* Barro Colorado Island, Aug. 1936, 1♂ (AMNH ex MCZ); June, 1 Aug. 1939, 2♀, 3♂; July 1950, 1♀, 1♂; Aug. 1950, 1♀ (USNM ex MCZ); Jan. 1958, 1♂ (all A. M. Chickering, MCZ or ex MCZ).

Specimens Examined. PANAMA *Coclé:* El Valle, July 1936, 1♂ (A. M. Chickering, MCZ). *Panamá:* Arraiján, Aug. 1936, 1♂ (A. M. Chickering, MCZ); Forest Preserve, 29 Jan. 1958, 1♂ (A. M. Chickering, MCZ); Summit, Aug. 1950, 2♀, 1♂ (A. M. Chickering, MCZ); nr. Gamboa, July 1981, 1♂ (W. Eberhard, USNM ex MCZ); July 1984, 1♀ (W. Eberhard 2669, MCZ); Cocoli, 24 Nov. 1954, 1♀ (W. Lundy, AMNH); Farfan, 9 Jan. 1958, 1♀ (A. M. Chickering, USNM ex MCZ); Fort Kobbe, 3 Aug, 1983, 1♂ (H., L. Levi, H. Stockwell, MCZ); Miraflores Locks, 3 Jan. 1958, 1♀ (A. M. Chickering, MCZ).

Pronous valle new species
Figures 117–121; Map 4G

Holotype. Male holotype from near Saladito, 1,700 m, Depto. Valle, Colombia, Mar. 1976 (W. Eberhard 1051), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female paratype. Abdomen lacks an anterior median tubercle, other tubercles small. Total length 5.6 mm. Carapace 2.3 mm long, 1.9 wide, 1.1 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.0, metatarsus 1.5, tarsus 0.8. Second patella and tibia 1.8 mm, third 1.3. Fourth femur 2.5 mm, patella and tibia 2.4, metatarsus 1.9, tarsus 1.0.

Male holotype. Abdomen length between *P. intus* (Fig. 61) and *P. tuberculifer* (Fig. 62). Total length 3.8 mm. Carapace 1.7 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 1.8 mm, patella and tibia 1.5, metatarsus 1.2, tarsus 0.7. Second patella and tibia 1.4 mm, third 1.1. Fourth femur 1.9 mm, patella and tibia 1.8, metatarsus 1.4, tarsus 0.7.

Note. Males and females were matched on the basis of having been collected from the same locality.

Variation. The male holotype is newly molted and the palpus was preserved when still soft. An older male might have other areas of the palpus sclerotized and darker than in the one illustrated (Fig. 121).

Diagnosis. The female of *P. valle* differs from females of *P. pance* and *P. tuberculifer* species by having the angle of the epigynum margin on each side more obtuse (Fig. 117) and, in posterior view, the median plate widens dorsally (at 6 hr in Fig. 120). The male differs from other species by having a lightly colored lobe on the outside curvature of the embolus (in center of Fig. 121) and by having an annulate transverse spine on the median apophysis (Fig. 121).

Paratype. COLOMBIA *Valle:* Saladito, 1,700 m, Apr. 1977, 1♀ (W. Eberhard 1162, MCZ).

Pronous pance new species
Figures 122–126; Map 4G

Holotype. Male holotype and one male and five female paratypes from Río Pance, near Cali, 1,100 m, Colombia, 23 Mar. 1970 (W. Eberhard I-290), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female paratype. The sides of the carapace are dusky, and there is a median, dorsal gray line on the abdomen. Total length 4.5 mm. Carapace 2.1 mm long, 1.7 wide, 0.9 behind lateral eyes. First femur 1.9 mm, patella and tibia 1.8, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.7 mm, third 1.3. Fourth femur 2.1 mm, patella and tibia 2.1, metatarsus 1.7, tarsus 0.7.

Male paratype. Abdomen shape between *P. intus* (Fig. 61) and *P. tuberculifer* (Fig. 62). Total length 3.8 mm. Carapace 1.7 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 1.7 mm, patella and tibia 1.7, metatarsus 1.3, tarsus 0.7.

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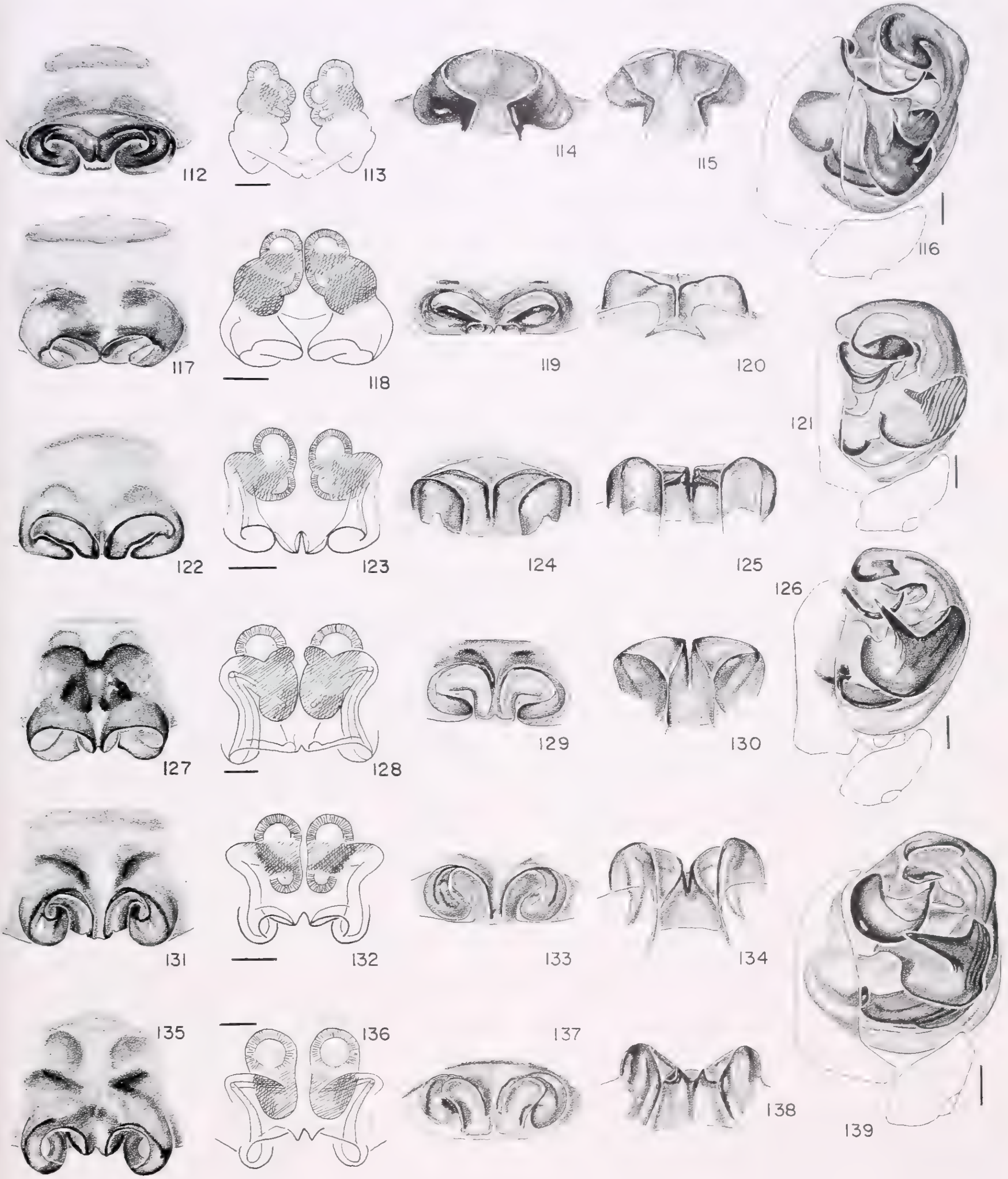
Figures 112–116. *Pronous shanus* n. sp. 112–115, female epigynum. 112, ventral. 113, ventral, cleared. 114, ventroposterior. 115, posterior. 116, male left palpus.

Figures 117–121. *P. valle* n. sp. 117–120, female epigynum. 117, ventral. 118, ventral, cleared. 119, ventroposterior. 120, posterior. 121, male palpus.

Figures 122–126. *P. pance* n. sp. 122–125, female epigynum. 122, ventral. 123, ventral, cleared. 124, ventroposterior. 125, posterior. 126, male palpus.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Figures 127–130. *P. nigripes* Caporiacco, female epigynum. 127, ventral. 128, ventral, cleared. 129, ventroposterior. 130, posterior.

Figures 131–139. *P. tuberculifer* n. sp. 131–138, female epigynum. 131, 135, ventral. 132–136, ventral, cleared. 133, 137, ventroposterior. 134–138, posterior. 139, male palpus. 131–134, 139, (Peru). 135–138, (Guyana).

Scale lines. 0.1 mm.

Second patella and tibia 1.5 mm, third 1.1. Fourth femur 1.8 mm, patella and tibia 1.8, metatarsus 1.5, tarsus 0.5.

Note. Males and females were collected together.

Variation. Total length of females 4.5 to 4.8 mm.

Diagnosis. The female differs from other species by the semicircular openings and the wide anterior lip of the epigynum (Fig. 122). The male has a short filamentous embolus (Fig. 126), narrower than that of *P. intus* (Fig. 111) and *P. valle* (Fig. 121) and a larger transverse spine on the median apophysis (Fig. 126) than in *P. shanus* (Fig. 116) and *P. valle* (Fig. 121).

Paratype. COLOMBIA *Valle:* Río Pance nr. Cali, 1,100 m, 22 June 1970, 1♀ (W. Eberhard 290, MCZ).

Specimens Examined. COLOMBIA *Cauca:* Río Palacé, Totoró, 1,800 m, oak forest, 24 Mar. 1967, 1♀, uncertain determination (R. Root, W. L. Brown, MCZ).

Pronous nigripes Caporiacco
Figures 127–130; Map 4G

Pronous nigripes Caporiacco, 1947: 25; 1948: 662, figs. 71, 72, ♀, ♂. Female lectotype, immature paralectotype, designated by Levi (1985: 542), from Port Diamond (perhaps Great Diamond, or Diamond Plantation, both 6°43′N, 58°11′W), Guyana, in MZUF, examined. Male paralectotype is *Micrathena acuta* (Walckenaer) (Levi, 1985).

Description. Female lectotype. Coloration as in other species, except sternum light; coxae dark or brown, legs black. Carapace slightly rugose. Total length 4.8 mm. Carapace 1.9 mm long, 1.6 wide, 0.9 behind lateral eyes. First femur 2.0 mm, patella and tibia 2.0, metatarsus 1.5, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.3. Fourth femur 2.7 mm, patella and tibia 2.4, metatarsus 2.1, tarsus 0.8.

Variation. Total length of females 4.7 to 4.8 mm. The illustrations (Figs. 127–130) were made from the lectotype.

Diagnosis. The pair of black patches within the dusky patch of the epigynum (Fig. 127) separate this species from *P. tuberculifer*, *P. intus*, and other South American species. Unlike *P. tuberculifer*, *P. nigripes* has the openings in posterior view of the epigynum with their long axis transverse (Fig. 130). The epigynum lacks overhang above the openings (Fig. 127).

Specimens Examined. GUYANA Tumatumari, 21 July 1936, 1♀ (MZUF).

Pronous tuberculifer Keyserling
Plate 2, Figures 57, 62, 131–139; Map 4D

Pronous tuberculifer Keyserling, 1881: 548, pl. 16, fig. 1, ♀, ♂. Male lectotype and two female paralectotypes from Amable María [Depto. Junín], Peru, in PAN, examined; Keyserling, 1892: 35, pl. 2, fig. 31, ♀, ♂.

Note. Simon (1895: 863, figs. 922–924), Bonnet (1958: 3778) and Roewer (1942: 967) erroneously considered all American specimens, and all citations of the genus *Pronous,* to refer to *P. tuberculifer.*

Description. Female from Tingo María, Peru. Abdomen lacking anterior median tubercle; other tubercles small (Fig. 57). Total length 5.4 mm. Carapace 2.2 mm long, 1.8 wide, 1.0 behind lateral eyes. First femur 1.9 mm, patella and tibia 2.0, metatarsus 1.5, tarsus 0.7. Second patella and tibia 1.8 mm, third 1.3. Fourth femur 2.5 mm, patella and tibia 2.3, metatarsus 1.9, tarsus 0.8.

Male from Tingo María, Peru. Abdomen as in Figure 62. Total length 3.7 mm. Carapace 1.8 mm long, 1.5 wide, 0.7 behind lateral eyes. First femur 1.7 mm, patella and tibia 1.7, metatarsus 1.3, tarsus 0.7. Second patella and tibia 1.3 mm, third 1.1. Fourth femur 2.0 mm, patella and tibia 1.8, metatarsus 1.7, tarsus 0.7.

Note. Males and females were paired in the original description, and both belong to the only species of *Pronous* collected so far in Peru.

Variation. Total length of females 3.9 to 5.4 mm, males 3.3 to 4.6. The female illustrated (Figs. 131–134) came from Tingo María, Peru, the male (Fig. 139) from the Depto. Amazonas, Peru, and Figures 135–138 from Guyana.

Diagnosis. The epigynum differs from that of other *Pronous* by having a V-shaped dusky patch and by the lateral overhang covering the openings (Figs. 131, 135). In posterior view the longest diameter of the opening is longitudinal (Figs. 131, 135); in others it is transverse (Fig. 130). The embolus is almost semicircular (it may be transparent; Fig. 139); a similar embolus is found only in the Mexican *P. beatus*. Also, unlike all other species, *P. tuberculifer* has the conductor with a small cylindrical projection directed to the right (in a left palpus pointing toward 3 hr in Fig. 139) and a short tegulum lobe (Fig. 139).

Natural History. The male from Alto Río Comaina came from secondary vegetation at the border of a swamp.

Distribution. Guyana, Amazon area to Misiones Prov., Argentina. Male specimens (readily determined) have been found in Minas Gerais, Brazil, and in Paraguay and Bolivia (Map 4D).

Specimens Examined. GUYANA Mackenzie [06°00′N, 58°17′W], 10 km below Three Friends on Demerara River, 55 m el. (Stephens and Traylor, 1985), Sept. 1931, 1♀ (MZUF). COLOMBIA *Putumayo:* Río Putumayo, nr. Puerto Asis, no date, 1♀ (W. Eberhard 434, MCZ). ECUADOR *Sucumbíos:* bridge over Río Cuyabeno on road betw. Tarapoa & Tipishca, 0°01′S, 76°18′W, 8–9 Aug. 1988, 1♀ (W. Maddison, MCZ); Reserva Faunistica Cuyabeno, Laguna Grande, Sendero La Hormiga, 00°00′, 76°10′W, 2–5 Aug. 1988, 2♀ (W. Maddison, MCZ). *Napo:* Pampeya, Río Napo, May 1965, 2♀ (L. Peña, MCZ). *Pichincha:* Cayambe, 2,300 m, June 1965, 1♂ (L. Peña, MCZ). *Zamora Chinchipé:* Río Jumbué, 1 June 1965, 1♂ (L. Peña, MCZ). PERU *Amazonas:* Alto Río Comaina, Puesto de Vigilancia, 22, Falso Paquisha, 850–1,150 m, 21 Oct.–3 Nov. 1987, 1♂ (D. Silva D. MUSM). *Huánuco:* Cucharas, Huallaga Valley, Feb.–Apr. 1954, 1♀ (F. Woytkowski, CAS); Tingo María, 26 May 1947, 1♀, 1♂ (J. C. Pallister, AMNH), 2 June 1967, 1♀ (A. F. Archer, S. Risco, AMNH); Monzón Valley nr. Tingo María, 10 Nov. 1954, 2♀ (E. S. Ross, E. I. Schlinger, CAS). BRAZIL *Amazonas:* Reserva Porto Alegre, 80 km N Manaus, 27 May 1992, 1♀ (H. G. Fowler, MCZ). *Paraíba:* Independência, 1911, 1♀ (W. M. Mann, MCZ). *Pernambuco:* Pernambuco [Recife], (SMF). *Minas Gerais:* Mina Serinha, Diamantina, Dec. 1944, 1♂ (E. Cohn, AMNH). *Paraná:* Cataratas do Iguaçu, 18–25 Mar. 1985, 2♀ (H., L. Levi, MCZ). PARAUGAY *Concepción:* Apa, Jan.–Feb. 1909, 1♂ (AMNH). *Cordillera:* San Bernardino, 1♀ (E. Reimoser, MCZ). BOLIVIA *El Beni:* Estac. Biol. Beni, 14°47′S, 65°15′W, 225 m, 8–14 Nov. 1989, 1♂ (J. Coddington et al., USNM). ARGENTINA *Misiones:* Montecarlo, Jan. 1966, 1♀ (M. E. Galiano, MEG).

Spilasma Simon

Spilasma Simon, 1895: 794, fig. 856, ♂ abdomen, fig. 857 ♀ eye region. Type species *Spilasma artifex* Simon, 1895 (=*S. duodecimguttata* (Keyserling, 1880)] by original designation and monotypy. The gender of the name is feminine (Bonnet, 1958: 4121).

Diagnosis. *Spilasma* has a narrow cephalic region of the carapace (Figs. 146, 154) as in *Cyclosa* and *Acacesia*. *Spilasma* differs from *Cyclosa* by having few setae on the carapace and lacking the dark rings on the legs (Fig. 145). *Spilasma* differs from both *Cyclosa* and *Acacesia* by having an oval abdomen, widest in the middle, with six dorsal pairs of white patches, and differs from many araneids by having no markings in the midline of the abdomen and no folium pattern (Fig. 145).

Description. Cephalothorax glabrous, orange to orange-brown without marks. Abdomen oval, widest in middle, with dorsal paired patches of white (Fig. 145) and no ventral markings. Posterior median eyes subequal to anterior medians and their diameter or less apart. The epigynum has a ventrally extending lobe (Figs. 140, 142) with posterior sculpturing (Fig. 143).

Male smaller than female, with ventral sclerotized area from sides of pedicel to genital groove (Fig. 153). Endite without tooth, no coxal hook. Palpal patella with two weak setae. Second tibia thinner than first.

Relationship. *Spilasma* can be placed with the *Alpaida* group of species, on the basis of the following characters: the epigynum is lobe-shaped (Figs. 140–144); the tegulum is free in the upper right corner of the left palpus (T in Fig. 151); the conductor is in the middle of the tegulum, not the upper right in the left palpus (C in Fig. 151); the median apophysis is without spines or flagella (except distally) and projects beyond bulb of palpus (M in Fig. 151); in the upper left of the conductor (in the left palpus) there is a pocket (C in Fig. 161), which may be a homolog with the paramedian apophysis. The narrow cephalic region of the carapace is probably a synapomorphy with *Acacesia* Simon

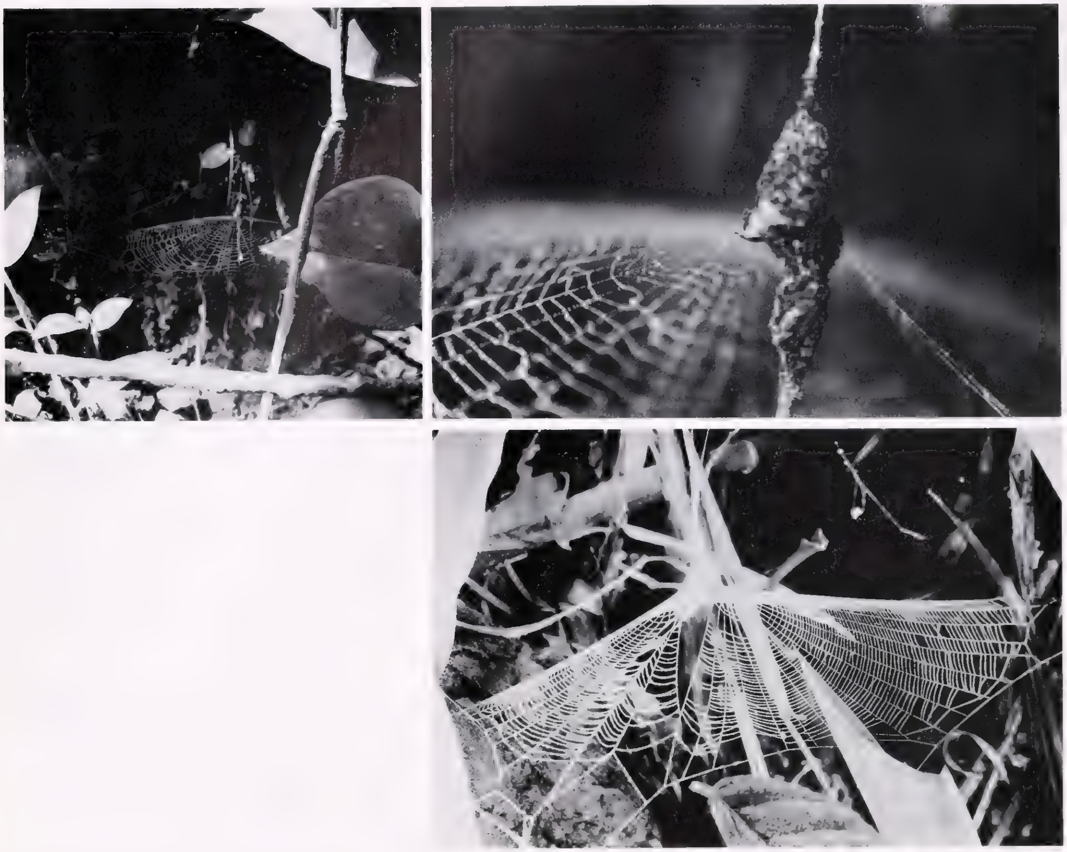


Plate 3. *Spilasma duodecimguttata.* Web diameter of upper web about 25 cm, lower one 10.4 cm (upper photos, R. L. C. Baptista; lower photo, J. A. Coddington).

(Glueck, 1994) and perhaps also with *Cyclosa.*

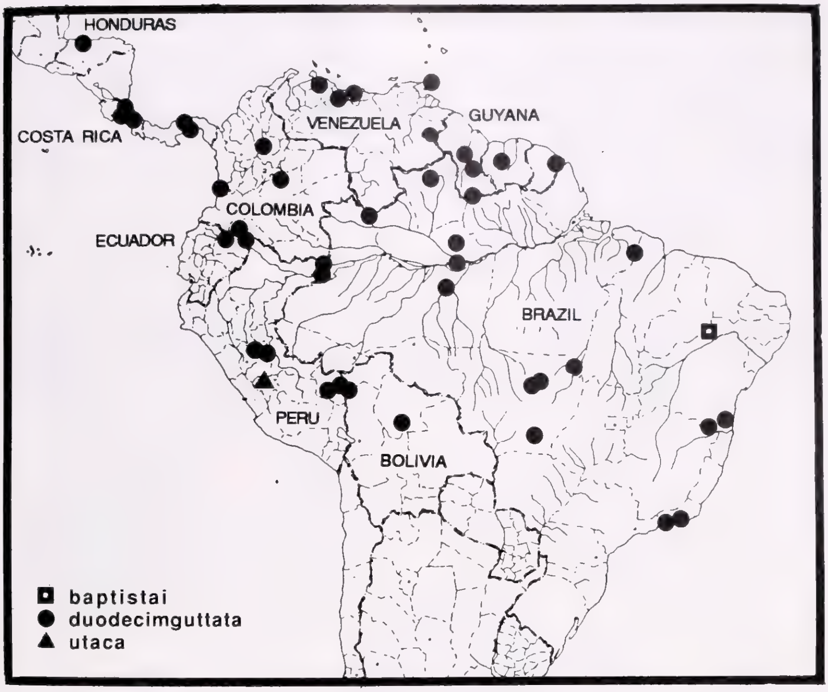
Natural History. The web is horizontal, pulled up at the hub, with sticky threads (W. Eberhard, personal communication) and, above the hub, a median granular retreat, with sand grains, having a lateral flap (Pl. 2). The flap pulls in when disturbed. The retreat is also used to house the eggsacs (Lubin, 1978).

Distribution. There are three American species, with only one specimen each available for two of them, from Honduras to Rio de Janeiro State, Brazil. *Spilasma africana* Simon, 1903, from Spanish Guinea, is the only described species not from America. The specimens of *S. africana* are lost, and the species was synonymized with *Prasonica seriata* Simon, 1895, by Grasshoff (1971). *Prasonica* is a genus related to *Mangora.*

KEY TO *SPILASMA* SPECIES

The female of *S. utaca* and the male of *S. baptistai* are not known.

1. Males 2
– Females 3
2(1). A pair of deep longitudinal grooves on carapace (Fig. 161); base of embolus with duct making two loops (Fig. 160); Peru (Map 5) .... *utaca*
– Carapace without grooves (Fig. 152); embolus duct with one loop (Figs. 149–151); from Honduras to Bolivia and southern Brazil (Map 5) .... *duodecimguttata*
3(1). In posterior view of epigynum, slit-shaped openings face laterally (Fig. 157); Pernambuco, Brazil (Map 5) .... *baptistai*



Map 5. Distribution of *Spilasma* species.

– In posterior view of epigynum, slit-shaped openings face anteromedially (Figs. 141, 143); Honduras to Bolivia and southeastern Brazil .... *duodecimguttata*

Spilasma duodecimguttata (Keyserling) Plate 3; Figures 140–155; Map 5

Singa duodecimguttata Keyserling, 1880: 302, pl. 4, fig. 6, ♀. Female holotype from New Granada [old name for Colombia], in BMNH, examined. Keyserling, 1893: 286, pl. 14, fig. 211, ♀. Roewer, 1942: 877.

Epeira lamentaria Keyserling, 1883: 199, pl. 15, (?fig. 5); 1892: 174, pl. 8, (?fig. 128). Female holotype from Amazon Prov., Brazil at HECO, examined. NEW SYNONYMY.

Spilasma tredecimguttata Simon, 1895: 789, figs. 856, 857, ♂ abdomen, ♀ eyes; 1897: 476. Many male and female syntypes from the Amazon in MNHN no. 1010, examined. Roewer, 1942: 776. Bonnet, 1958: 4121. NEW SYNONYMY.

Spilasma artifex Simon, 1895: 794; 1897: 477, pl. 12, figs. 1–5, pl. 13, fig. 1, web. Female holotype from San Esteban, Venezuela, MNHN no. 10127, examined. Roewer, 1942: 776. Bonnet, 1958: 4121. NEW SYNONYMY.

Epeira davisi Hingston, 1932: 365, fig. 40, web. Specimens from Guyana, in BMNH, lost. NEW SYNONYMY.

Aranea lamentaria:—Roewer, 1942: 845.

Araneus duodecimguttatus:—Bonnet, 1955: 449.

Araneus lamentarius:—Bonnet: 1955: 526.

Spilasma coccineum Caporiacco, 1955: 344, fig. 29, ♂. Male holotype from Rancho Grande, Venezuela, in UCVC, not examined. Brignoli, 1983: 280. NEW SYNONYMY.

Note. The small illustration of Keyserling (1883, fig. 5; and the same in 1892, fig. 128) does not look like the epigynum of this species. Keyserling may have illustrated an artifact or debris. Caporiacco's (1955) illustration of the male palpus of *S. coccineum* is good.

Lopez (1985: 86) described a new species, *Spilasma richei,* collected along the path from Roura to Kaw, southeast of Cayenne, French Guyana. He placed it in the Museum de Béziers, France, but it has been lost (Lopez, 1986, personal communication). Few diagnostic characters are provided for *S. richei* except for noting the difference in "la spinulation des pattes et la form précise de l'epigyne", but a detailed description is forthcoming (Lopez, 1985: 87). This is considered a nomen nudum. It is also not listed in Platnick's catalogs (1989, 1993).

The genitalia of *S. duodecimguttata* are quite variable. When many specimens from different locations are available, one readily sees the reason for the many synonymies cited here.

Epeira davisi was erroneously placed in *Cyrtophora* by Levi (1991b: 179).

Description. Female from Depto. Meta, Colombia. Carapace, chelicerae, labium, endites, sternum, legs, bright orange. Dorsum of abdomen orange, with a gray cast, with six pairs of symmetrical white patches (Fig. 145); venter darker gray. Posterior median eyes same diameter as anterior medians, laterals 0.7 diameter. Anterior median eyes 0.3 diameter apart, 0.8 diameter from laterals. Posterior median eyes 0.5 diameter apart, 1.1 diameters from laterals. Ocular rectangle, slightly longer than wide. Height of clypeus equals 0.4 diameter of anterior median eye. Sternum slightly wider than long. Abdomen oval, widest anterior of middle (Fig. 145). Total length 4.5 mm. Carapace 2.0 mm long, 1.9 wide, 0.8 behind lateral eyes. First femur 2.3 mm, patella and tibia 2.3, metatarsus 1.3, tarsus 1.0. Second patella and tibia 2.0 mm, third 1.2, fourth 2.0.

Male from Depto. Meta, Colombia. Color as in female. Distal leg articles darkest. Posterior median eyes 0.7 diameter of anterior medians, laterals 0.5 diameter. Anterior median eyes 0.2 diameter apart, 0.6 diameter from laterals. Posterior median eyes 0.7 diameter apart, 1.2 diameters from laterals. Height of clypeus equals the diameter of an anterior median eye. Abdomen widest in middle, with a soft, but sclerotized shield in the area anterior to the genital groove (Fig. 153). Total length 3.2 mm. Carapace 1.6 mm long, 1.3 wide, 0.5 behind lateral eyes. First femur 1.6 mm, patella and tibia 1.6, metatarsus 1.0, tarsus 0.7. Second patella and tibia 1.4 mm, third 0.9, fourth 1.3.

Note. Males and females have been collected together.

Variation. The genitalia of no two specimens look quite alike, and each new specimen makes one think they have a new species. Most variation is in the protuberance of the epigynum: some having a semicircular keel (Figs. 140–142), some not (Figs. 143, 144). The male palpus also varies in structure. The tip of the median apophysis and the curvature of the embolus are unusually variable (Figs. 149, 150). Some individuals lack white patches on the abdomen. Total length of females 3.0 to 7.0 mm, males 2.2 to 3.6. Most illustrations were made from specimens from Depto. Meta, Colombia, but Figures 143–145 and 150 were made from specimens from 80 km north of Manaus, Brazil.

Diagnosis. The first femur and patella-tibia are of about the same length, unlike those of most other araneids. The epigynum differs from *S. baptistai* by having the slit openings face anteriomedially (Figs. 141, 143); the male differs from *S. utaca* by lacking the pair of grooves on the carapace (Fig. 161). The male palpus superficially resembles that of *Ocrepeira yaelae* Levi (1993a, fig. 359).

Natural History. Spilasma duodecimguttata is found in foliage of wet forest in Guapiles, Costa Rica; in lowland forest, El Dorado, Venezuela; in rain forest near Leticia, Colombia; in secondary forest by a lake 15 km southwest of Puerto Lopez, Colombia; in forest interior in reserves

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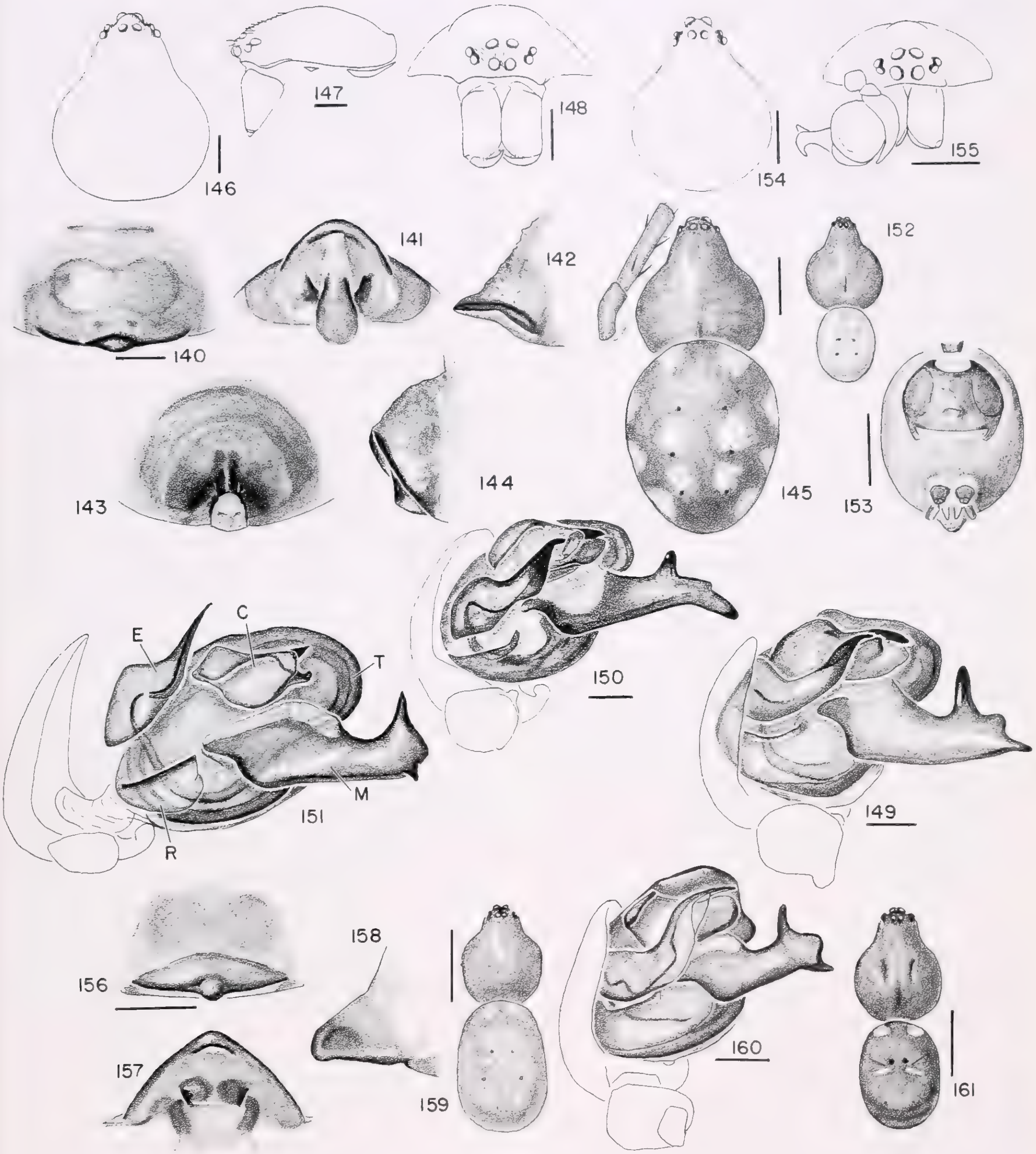
Figures 140–155. *Spilasma duodecimguttata* (Keyserling). 140–148, female. 140–144, epigynum. 140, 143, ventral. 141, posterior. 142, 144, lateral. 145, dorsal. 146, carapace. 147, carapace and cheliera. 148, eye region and chelicerae. 149–155, male. 149–151, left palpus. 149, 150, mesal. 151, pulled apart. 149, 151, (Depto. Meta, Colombia). 151, (N of Manaus, Brazil). 152, dorsal. 153, abdomen ventral. 154, carapace. 155, eye region, chelicerae and right palpus.

Figures 156–159. *S. baptistai*, female. 156–158, epigynum. 156, ventral. 157, posterior. 158, lateral. 159, dorsal.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Figures 160, 161. *S. utaca,* male. 160, palpus. 161, dorsal.

Abbreviations. C, conductor. E, embolus. M, median apophysis. R, radix. T, tegulum.

Scale lines. 1 mm, genitalia 0.1 mm, except Figures 146–148, 153–155, 0.5 mm.

north of Manaus, Brazil. In Rio de Janeiro, Brazil, a web was found to be 40 cm above ground.

Distribution. Honduras to Rio de Janeiro State, Brazil, and Bolivia (Map 5).

Specimens Examined. HONDURAS *Atlantida:* Lancetilla, ♀ (MCZ). COSTA RICA *Limón:* 5.5 km E Guapiles, ♂ (DU). *Heredia:* Finca La Selva, ♀, ♂ (CAS, MCZ). *Puntarenas:* Reserva Carara nr. Tarcoles, ♀ (MCZ). *Cartago:* Turrialba, ♂ (AD). PANAMA *Panamá:* Barro Colorado Island, ♀, ♂ (MCZ); Cerro Galero, ♂ (MCZ). WEST INDIES *Trinidad:* Old Gold Mine, Arima Ward, ♀ (USNM). VENEZUELA *Aragua:* Rancho Grande, ♂ (AMNH), ♀ (MCZ), ♀, ♂ (USNM). *Bolívar:* 22 km S El Dorado, ♂ (AMNH). *Falcón:* 3 km S El Hondo de Uria, 15 km E Curimagua, ♀ (MCZ). GUYANA Shudikar River, Upper Essequibo River, ♂ (AMNH); Upper Essequibo River, Onoro Region, ♀ (AMNH); Essequibo River opposite Twasinki Mtns., imm. (AMNH); Upper Essequibo River, nr. Akaramukra Rapids, ♂ (AMNH). SURINAM *Saramacca:* Voltzberg Raleighvallen Nature Reserve, ♀ (MCZ). FRENCH GUIANA nr. Camp Calman, Montagnes Kaw, ♀ (USNM). COLOMBIA *Santander:* Carare, Opon Capote 6°38′N, 73°55′W, ♂ (MCZ). *Meta:* 15 km SW Puerto Lopez, ♀, ♂ (MCZ). *Valle:* 28 km E Buenaventura, ♂ (MCZ); Central Anchicaya, ♀ (MCZ). *Putumayo:* Río Putumayo, nr. Pto. Asis, ♀ (MCZ). *Amazonas:* Amacayacu, 48 km NW Leticia, ♂ (MCZ); 18 km N Leticia, ♂ (AMNH); Leticia, ♀, ♂ (CAS). ECUADOR *Sucumbíos:* Reserva Faunistica Cuyabeno, ♀ (MCZ, MECN). *Napo:* Río Coca and Napo, ♂ (MCZ); 48.6 km NE Baeza, ♂ (MCZ). PERU *Huánuco:* Panguana, Río Pachitea, 9°37′S, 74°56′W, ♀ (MCZ); Monzón Valley, Tingo María ♀, ♂ (CAS); Dantas La Molina, Quebrada Sapote, SW Puerto Inca, 270 m, 9°38′S, 75°00′W, 1♀ (MUSM). *Madre de Dios:* Zona Reserva de Manu, ♀ (USNM); 15 km E Puerto Maldonado, ♂ (CAS); Res. Tambopata, 12°50′S, 69°17′W, ♀, ♂ (USNM). BRAZIL *Roraima:* Ilha de Maracá, ♀, ♂ (INPA). *Amazonas:* Cabo Frio Reserve, 80 km N Manaus, ♀, ♂ (INPA, MCN, MCZ); Colosso Reserve, 80 km N Manaus, ♀, ♂ (INPA, MCN, MCZ); Dimona Reserve, 80 km N Manaus, ♀, ♂ (MCZ); Gavião Reserve, 80 km N Manaus, ♂ (MCZ); Km 41 Reserve, 80 km N Manaus, ♀, ♂ (MCZ); Fazenda Esteio, Manaus, ♂ (INPA); Belém, periodically flooded forest, nr. confluence with Rio Solimões, ♂ (AMNH); Manaus, ♀, ♂ (MACN); Reserva Porto Alegre, 80 km N Manaus, ♀ (MCZ); Reserva Ducke nr. Manaus, ♀ (MCN, INPA); Parque Nacional do Pico da Neblina, Maturacá, ♀ (MCP). *Pará:* Canindé, ♀ (AMNH). *Bahia:* Encruzilhada, ♂ (AMNH); Fazenda Matiapã, Camacan, ♂ (MCN). *Mato Grosso:* Barra de Tapirapé, ♂ (AMNH, MCZ); Chapada dos Guimarães, ♀ (AMNH); Sinop, ♂ (AMNH); Villa Vera, 55°30′S, 12°46′W, ♂ (AMNH). *Rio de Janeiro:* Mangaratiba, ♂ (AMNH); Barra da Tijuca, ♀ (RLCB); Morro da Urca, ♀ (RLCB). BOLIVIA *El Beni:* 27 km SW Yucumo, 500 m, 15°50′S, 69°17′W, ♂ (USNM).

Spilasma baptistai new species

Figures 156–159; Map 5

Holotype. Female from Dois Irmãos Reservation, Recife, Pernambuco State, Brazil, 25 Jan. 1989 (R. L. C. Baptista, A. P. Chaves 2654) in MZSP. The species is named after the collector.

Description. Female holotype. Carapace, chelicerae, sternum, labium, and endites orange. Legs orange, distal articles darkest. Dorsum of abdomen with pairs of white patches (Fig. 159); venter gray. Eyes small. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.2 diameter apart, 1 diameter from laterals. Posterior median eyes 1 diameter apart, 1.3 diameters from laterals. Ocular quadrangle slightly longer than wide, slightly wider behind. Height of clypeus equals 0.5 diameter of the anterior median eye. Abdomen oval (Fig. 159). Total length 3.0 mm. Carapace 1.40 mm long, 1.19 wide, 0.57 behind lateral eyes. First femur 1.30 mm, patella and tibia 1.32, metatarsus 0.67, tarsus 0.52. Second patella and tibia 1.19 mm, third 0.71, fourth 1.10.

Diagnosis. The eyes are smaller than those of *S. duodecimguttata* (Fig. 159) and in posterior view of the epigynum, the median plate (Fig. 157) is relatively wider than that of *S. duodecimguttata* (Figs. 141, 143), and the openings face laterally (Fig. 157).

Natural History. The specimen was collected with its retreat. Vestiges of the web were projecting from refuge between leaves of a bush, 1.5 m above ground in secondary forest.

No other specimens were found.

Spilasma utaca new species

Figures 160, 161; Map 5

Holotype. Male holotype from 1,600 to 2,200 m, Utcuyacu [above Merced, 1,465 m, 11°12′S, 75°28′W; Stephens and Traylor, 1983], Depto. Junín, Peru, 4 Apr. 1948 (F. Woytkowski), in AMNH. The specific name is an arbitrary combination of letters.

Description. Male holotype. Carapace dark orange-brown. Chelicerae, labium, endites, sternum dark brown. Coxae brown, except posterior half of fourth coxae, which are light yellowish; legs dark brown. Dorsum of abdomen black with two pairs of white spots, the first round, the second diamond-shaped, and with transverse posterior dark bands (Fig. 161); venter black. Posterior median eyes 0.7 diameter of anterior medians, anterior laterals 0.7 diameter, posterior 0.6. Anterior median eyes 0.2 diameter apart, 0.4 diameter from laterals. Posterior median eyes 0.4 diameter apart, 1.2 diameters from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.7 diameter of anterior median eye. Sternum corniculate. Abdomen oval, widest behind middle (Fig. 161). Total length 3.0 mm. Carapace 1.59 mm long, 1.19 wide, 0.53 wide behind lateral eyes. First femur 1.00 mm, patella and tibia 1.72, metatarsus 0.87, tarsus 0.69. Second patella and tibia 1.56 mm, third 0.93, fourth 1.45.

Diagnosis. The carapace of *S. utaca* has a pair of grooves (Fig. 161) not present in *S. duodecimguttata* (Fig. 152), and the duct loops twice in the proximal end of the embolus (Fig. 160).

No other specimens were found.

Micrepeira Schenkel

Micrepeira Schenkel, 1953: 26. Type species *M. albomaculata* Schenkel by monotypy. The gender of the name *Micrepeira* is feminine.

Diagnosis. Micrepeira differs from most other araneid genera, including *Araneus* and *Singa* by the domed sternum (Figs. 186, 191) and a subspherical abdomen with bold, white dorsal markings: often a wide median, longitudinal band and a wide transverse band or a few pairs of transverse patches, but no white markings on the venter (Figs. 165, 176, 185, 190, 195, 204). Also in *Micrepeira*, the femora are the same length as the adjacent patella and tibia; in other genera, the femora are shorter. *Micrepeira* resembles the Indopacific *Anepsion* Strand, 1929 (Chrysanthus, 1969), but has a narrower cephalic region. It resembles the African *Pherenice* Thorell, 1899, but has a low clypeus, less than the diameter of the anterior median eye. *Micrepeira* differs from all similar genera by the following: the epigynum has a wide shelf, resembling that of *Alpaida*, with a tiny, soft, distal, pointed scape, easily overlooked (Figs. 162, 192, 200), by the male palpus, which has a large median apophysis bearing two flagella (Figs. 168, 177, M in Fig. 179), and a conductor either on the edge or inward on the tegulum, and no terminal apophysis or embolus lamella (Figs. 179, 180). The median apophysis flagella are, as usual, associated with a pointed scape of the female epigynum.

Description. Female. Cephalothorax glabrous, orange to brown without distinct marks, cephalic region wide (Figs. 166, 167). Eyes subequal. Median ocular quadrangle almost square. Height of clypeus 0.6 to 0.8 diameter of the anterior median eye. Legs relatively short and thick (Fig. 204).

Males much smaller than females (Fig. 181), width behind eye region less than half width of carapace. Endite with small tooth (*M. fowleri*) or none (*M. hoeferi*), no tubercle or tooth on palpal femur. No hook on first coxa, palpal patella with one macroseta. Second tibia as thick as or thinner than first, without any large macrosetae. Median apophysis of palpus has two proximal flagella associated with a pointed scape of the epigynum.

Relationship. The broad lobe of the epigynum, the palpus with a bare tegulum (at 1–2 hr in Fig. 168), the lack of distal hematodocha, the lack of terminal apophysis or embolus lamella, and the single macroseta on the palpal patella place the genus close to *Alpaida*. But the tiny, pointed scape of the epigynum (Figs. 162–164) and the two flagella of the median apophysis (Fig. 168, M in Fig. 179) suggest relationship with *Kaira, Aculepeira, Amazonepeira,* and *Metepeira,* all genera closer to *Araneus.* Although the pointed scape and flagella on the median apophysis were previously considered synapomorphies, evidence now indicates that this may be a homoplasious character, as the make-up of

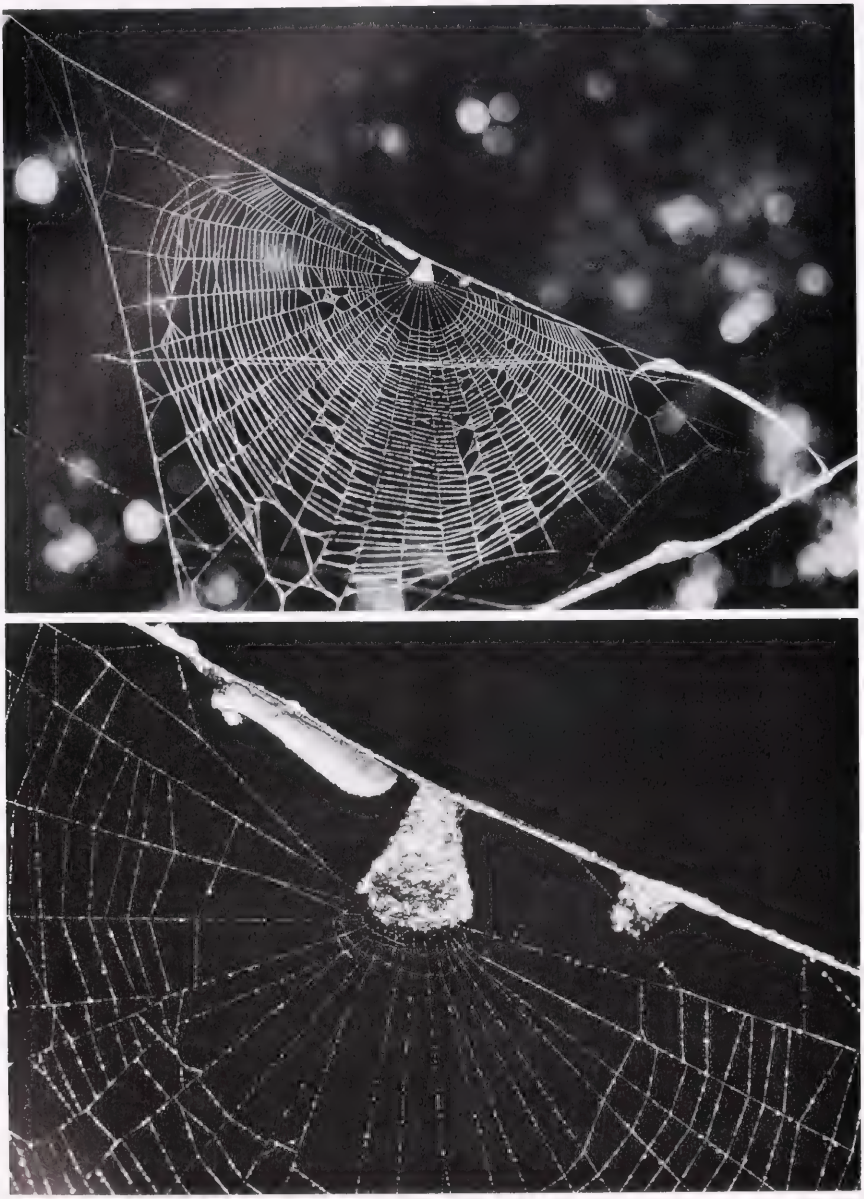
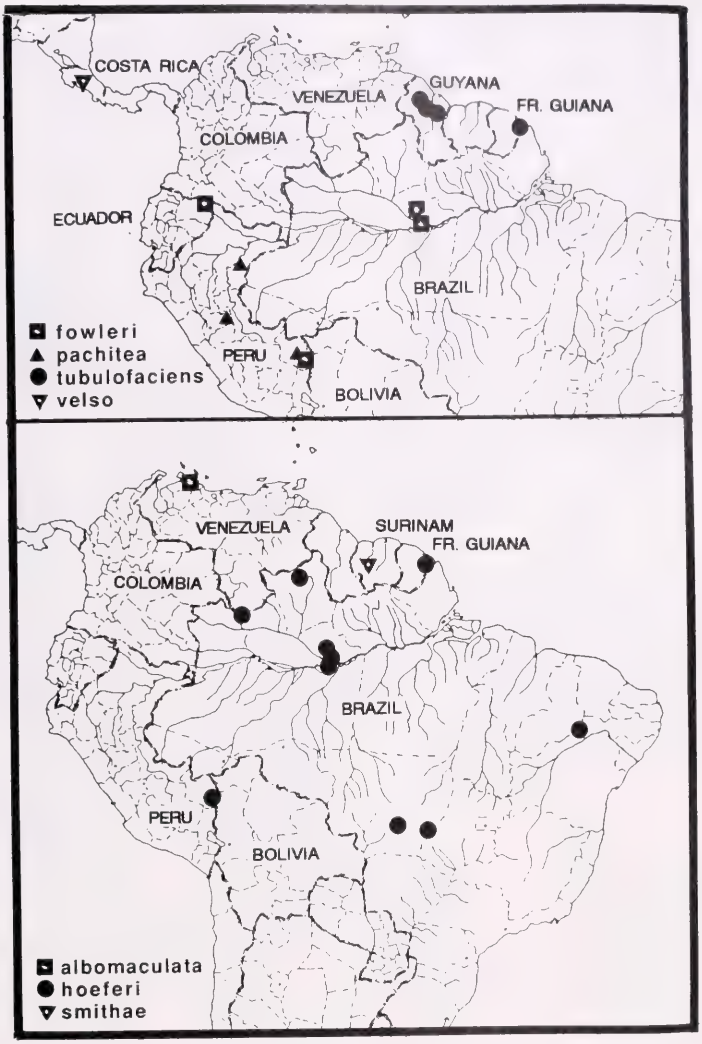


Plate 4. *Micrepeira hoeferi* n. sp. Diameter of web 20 cm, hub of web 150 cm above forest floor (photo, H. Höfer).

the genitalia of *Micrepeira* resembles so much more that of *Alpaida*. The position of the conductor (C in Figs. 179, 180, at 1 hr in Fig. 177 and at 11 hr in Fig. 178) is on the edge of the tegulum but is at the distal end and not above the median apophysis as in *Araneus*.

Natural History. Webs are known of three species (*M. hoeferi*, *M. tubulofaciens*, and *M. velso*). All have the shape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FR. GUIANA
COLOMBIA
ECUADOR
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PERU
BOLIVIA
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● tubulofaciens
▼ velso
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SURINAM
FR. GUIANA
COLOMBIA
BRAZIL
PERU
BOLIVIA
■ albomaculata
● hoeferi
▼ smithae

Map 6. Distribution of *Micrepeira* species.

of the lower half of a circle hanging on a line with a retreat above the hub (Pl. 4). The retreat is made of detritus and silk and has a lid that can be closed (Höfer note on label with specimen of *M. hoeferi*). At its pointed end, the retreat has two strong silk support lines covered by some detritus.

Distribution. All seven species are Central and South American (Map 6).

Key to *Micrepeira* Species

Males of *M. albomaculata*, *M. pachitea*, *M. smithae*, *M. tubulofaciens*, and *M. velso* are unknown.

1. Male 2
– Female 3
2(1). Middle of median apophysis with a lobe (Fig. 168); Amazonian Ecuador to Manaus region of Brazil (Map 6) .... *fowleri*
– Middle of median apophysis without lobe (M in Figs. 177–180); Guianas to Peru, Mato Grosso, Brazil (Map 6) .... *hoeferi*

3(1). Sternum with an anterior longitudinal groove (Fig. 191); Peruvian Amazon (Map 6) .... *pachitea*
– Sternum without such groove (Fig. 186) 4
4(3). Epigynum in ventral view a convex lobe (Fig. 200); Falcón State, Venezuela (Map 6) .... *albomaculata*
– Epigynum flat (Figs. 162, 171, 182, 187, 192, 196) 5
5(4). Epigynum posterior median plate overhanging laterals as in Figure 197; Costa Rica (Map 6) .... *velso*
– Posterior median plate otherwise; South America 6
6(5). Epigynum with posterior margin straight in ventral view and with narrow scape (Figs. 171, 174); Guianas, to Peru, and Mato Grosso, Brazil (Map 6) .... *hoeferi*
– Epigynum more or less triangular in ventral view or a triangular scape (Figs. 162, 182, 192) 7
7(6). Triangle formed by epigynum taking up most of posterior margin of epigynum (Figs. 162, 182) 8
– Triangle formed by epigynum making up less than half of posterior margin of epigynum (Fig. 192); Surinam (Map 6) .... *smithae*
8(7). Epigynal lobe marked as in Figure 182; Guianas (Map 6) .... *tubulofaciens*
– Epigynum without dark marks (Fig. 162); Amazonian Ecuador to Manaus region of Brazil (Map 6) .... *fowleri*

Micrepeira fowleri new species
Figures 162–170; Map 6

Holotype. Female holotype from 80 km north of Manaus, Km 41 Reserve, forest interior, Amazonas State, Brazil, 14 Apr. 1991, 200 m (H. G. Fowler, E. Venticinque, R. S. Vieira), in MCN no. 25536. The species is named after the collector.

Description. Female holotype. Carapace orange. Chelicerae, labium, endites orange. Sternum dusky orange. Coxae orange; legs dusky orange, darker distally. Dorsum of abdomen dark dusky with a longitudinal, median band of white pigment patches and a pair of white patches; posterior black with a pair of small posterior patches (Fig. 165); venter dusky with a median darker band from epigynum to spinnerets. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.4 diameter apart, 1 diameter from laterals. Posterior median eyes 0.7 diameter apart, 1.5 diameters from laterals. Total length 3.0 mm. Carapace 1.36 mm long, 1.24 wide, 0.75 behind lateral eyes. First femur 1.18 mm, patella and tibia 1.18, metatarsus 0.62, tarsus 0.54. Second patella and tibia 1.09 mm, third 0.65, fourth 1.03. First tibia 0.22 mm thick.

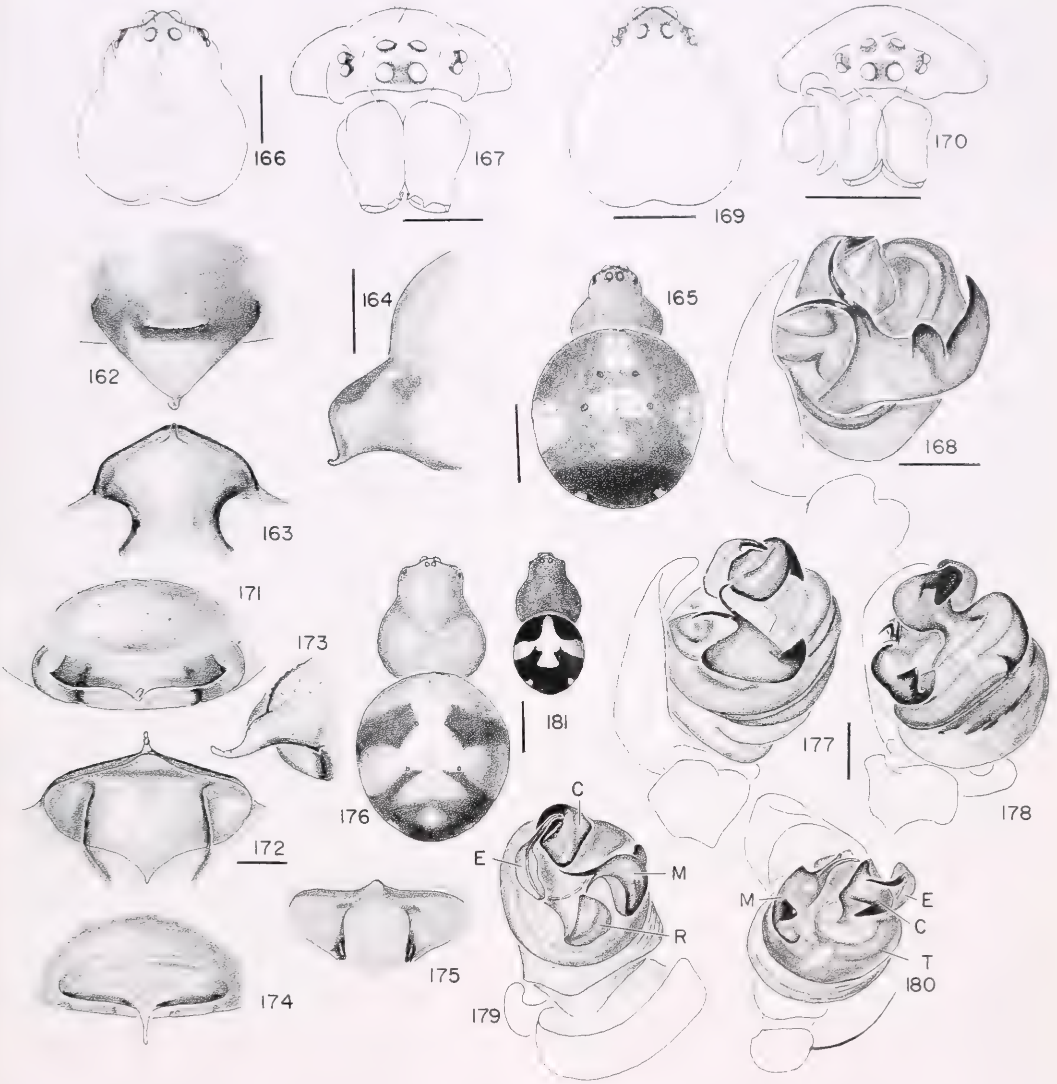
Male paratype. Color as in female except lacking anterior abdominal white pigment patches, having only the posterior pair. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.7 diameter apart, 0.7 diameter from laterals. Posterior median eyes 0.8 diameter apart, 1.2 diameters from laterals. Endite with small tooth. Total length 1.8 mm. Carapace 1.07 mm long, 0.88 wide, 0.44 behind lateral eyes. First femur 0.91 mm, patella and tibia 0.81, metatarsus 0.49, tarsus 0.40. Second patella and tibia 0.72 mm, third 0.45, fourth 0.65.

Note. Males and females were collected together; both have the posterior of the abdomen black.

Variation. Total length of females 2.4 to 3.5 mm, males 1.8 to 2.1. The anterior, median, transverse groove of the epigynum (center of Fig. 162) may be absent or different in width from that illustrated. Illustrations were made from specimens collected 80 km north of Manaus.

Diagnosis. Micrepeira fowleri, unlike other species, has its abdomen black posteriorly, contrasting with the lighter anterior three-quarters (Fig. 165). Females are smaller than *M. hoeferi* and are separated from them by having a large triangular lobe of the epigynum with a central transverse groove or dark mark between two darker areas (Fig. 162) and by having concave sides of the posterior median plate (Fig. 163). The male differs from that of *M. hoeferi* by having a lobe in the middle of the median apophysis (Fig. 168). It is possible that all specimens considered *M. fowleri* are variants of *M. tubulofaciens.*

Natural History. Specimens of *M. fowleri* were collected in forest border and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Figures 162–170. *Micrepeira fowleri* n. sp. 162–167, female. 162–164, epigynum. 162, ventral. 163, posterior. 164, lateral. 165, dorsal. 166, carapace. 167, eye region and chelicerae. 168–170, male. 168, left palpus. 169, carapace. 170, eye region, chelicerae, and right palpus.

Figures 171–181. *Micrepeira hoeferi* n. sp. 171–176, female. 171–175, epigynum. 171, 174, ventral. 172, 175, posterior. 173, lateral. 171–173, (Mato Grosso State). 174, 175, (Amazonas State). 176, dorsal. 177–181, male. 177–180, left palpus. 177, mesal. 178, ventral. 179, 180 pulled apart. 181, dorsal.

Abbreviations. C, conductor. E, embolus. M, median apophysis. R, radix. T, tegulum.

Scale lines. 1.0 mm, genitalia 0.1 mm, except Figures 166, 167, 169, 170, 0.5 mm.

forest interior. The retreat has parallel sides, about 4.0 to 4.5 mm wide and 10 to 20 mm long.

Distribution. Amazonian Ecuador, Peru to Manaus Brazil (Map 6).

Paratypes. BRAZIL *Amazonas:* Km 41 Reserve, 25 May 1991, 1♀ (H. G. Fowler, E. Venticinque, R. S. Vieira).

Specimens Examined. ECUADOR *Sucumbíos:* Cuyabeno Reserve, Laguna Grande, 13 Feb. 1984, 1♀ (L. Avilés, MECN). PERU *Madre de Dios:* Zona Reservada Tambopata, 290 m, 12°50'S, 69°17'W, 14 June 1988, 1♀ (D. Silva D., MUSM). BRAZIL *Amazonas:* 80 km N Manaus, 2°24'S, 59°52'W, 26 Feb. 1989, ♂, 9 Nov. 1989, 1♂ (H. G. Fowler, MCZ); Cabo Frio Reserve, 80 km N Manaus, 1989, 1990, 5♀, 2♂; Colosso Reserve, 80 km N Manaus, 1989, 1990, 101♀, 16♂ (H. G. Fowler, E. Venticinque, R. S. Vieira, MCZ); Dimona Reserve, 1989–1992, 5♀, 1♂ (H. G. Fowler, MCZ); Reserva Porto Alegre, 80 km N Manaus, 1989–1992, 2♀ (H. G. Fowler, MCZ); Reservacida de Powel, 20 Apr. 1991, 1♀ (H. G. Fowler, MCZ); Reserva Ducke, 4 Oct. 1990, 1♀ (H. Höfer, INPA).

Micrepeira hoeferi new species
Plate 4; Figures 171–181; Map 6

Holotype. Female holotype from igapó Tarumã Mirím, near Manaus, Amazonas State, Brazil, 11 Feb. 1988 (H. Höfer), in INPA. The species is named after H. Höfer, who collected it and photographed its web.

Spilasma tubulofaciens:—Quintero, 1974: 307, figs. 1–6, ♀, web.

Description. Female holotype. Carapace dusky orange, sides of thorax darkest. Chelicerae light brown. Labium, endites, sternum dark orange-brown. Coxae, legs brown with indistinct darker rings. Dorsum of abdomen with single and paired white patches on black (Fig. 176); sides, venter black. Posterior median eyes 1 diameter of anterior medians, laterals 0.8 diameter. Anterior median eyes 0.8 diameter apart, 2.2 diameters from laterals. Posterior median eyes 1 diameter apart, 3 diameters from laterals. Total length 5.0 mm. Carapace 2.5 mm long, 2.1 wide, 1.5 behind lateral eyes. First femur 1.8 mm, patella and tibia 1.8, metatarsus 1.1, tarsus 0.8. Second patella and tibia 1.7 mm, third 1.3, fourth 1.5.

Male from Mato Grosso. Color darker than female. Carapace, sternum brownish black. Only proximal portion of femur, metatarsi, and tarsi light; others contrastingly ringed. Dorsum of abdomen with white cross and a pair of white posterior spots (Fig. 181), venter with white band around anterior above carapace. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 0.8 diameter apart, 1.5 diameters from laterals. Posterior median eyes their diameter apart, 2.1 diameters from laterals. Total length 2.4 mm. Carapace 1.3 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 1.2 mm, patella and tibia 1.2, metatarsus 0.7, tarsus 0.6. Second patella and tibia 1.1 mm, third 0.7, fourth 0.9.

Note. Males and females have been collected together; they have a similar color pattern on the abdomen (Figs. 176, 181).

Variation. Total length of females 5.0 to 6.3 mm, males 1.5 to 2.4. Figures 171–173 and 176–181 were made from specimens from Mato Grosso and Figures 174 and 175 from the female holotype.

Diagnosis. Females are larger than those of *M. tubulofaciens,* and the epigynum, in ventral view, has a straight posterior border (Figs. 171, 174). In both *M. fowleri* and *M. tubulofaciens,* the epigynum has a triangular median lobe in ventral view (Figs. 162, 182).

Natural History. With the type specimen is a note saying that it came from a vertical web, the orb truncate above, with a cone-shaped retreat with cover; web diameter 20 cm, built about 1.5 m above ground, mesh width 2 to 3 mm (Pl. 4). The retreat is made of silk and detritus particles and is about 8 mm wide and 13 mm long. Another measured 7 by 30 mm. Two specimens collected by R. L. C. Baptista were 1.8 and 2.0 m above ground, in forest. The female from French Guiana was collected with the female of *M. tubulofaciens* in forest clearing.

Distribution. French Guiana to Peru, to Mato Grosso, Brazil (Map 6). It may occur in Paraguay, on the basis of a diagram of a web, sent by J. Kochalka, with an inquiry about the genus of the builder.

Specimens Examined. FRENCH GUIANA Crique Limonade, 3–4 km SW Saúl, 21–22 Dec. 1972, 1♀ (D. Quintero, MCZ); Montagnes Kaw nr. Camp Calman, 27 km SE Roura, 4°33′N, 52°09′W, 25 Aug. 1988, ♀ (S. Marshall, USNM). PERU *Madre de Dios:* Zona Reservada Tambopata, 290 m, 12°50′S, 69°17′W, 4 June 1988, 1♀ (J. Coddington, USNM). BRAZIL *Roraima:* Ilha de Maracá, 20 July 1987, 2♀ (A. A. Lise, MCN 20065); 1♀ (F. P. Benton, MCN 20066). *Amazonas:* Parq. Nacion. Pico da Neblina, Maturacá, 11 Oct. 1990, 1♀ (A. A. Lise, MCP); Colosso Reserve, 80 km N Manaus, 18 Jan. 1989, 2♀ (H. G. Fowler, MCZ); 2 March 1990, 1♀ (H. G. Fowler, R. S. Vieira, E. Venticinque, MCZ); 80 km N Manaus, 17 Jan. 1989, 1♀ (H. Fowler, MCZ); Reserva Campina, Manaus, 22 Jan. 1973, 1♂ (L. P. Albuquerque, MCN 21179); Reserva Ducke, Manaus, 4 Aug. 1987, 1♀ (A. A. Lise, MCN 23357); 15 Aug. 1991, 2♀ (A. D. Brescovit, MCN 21392). *Pernambuco:* Dois Irmãos Forest Reserve, 25 Jan. 1989, 1♀ (R. L. C. Baptista, A. P. Chaves, RLCB). *Mato Grosso:* Chapada dos Guimarães, 15–26 July 1992, 4♀, 2♂, 2 imm. (A. A. Lise, A. Braul, MCP, 2358, 2361); Chavantina, 22 Jan. 1947, 1♀, doubtful det. (H. Sick, MZSP). *Espírito Santo:* Dois Bocas Forest Reservation, 15 Nov. 1988, 2♀ (R. L. C. Baptista, A. P. Chaves, RLCB).

Micrepeira tubulofaciens (Hingston) new combination

Figures 182–186; Map 6

Epeira tubulofaciens Hingston, 1932: 366, figs. 40, 41 (webs). Female holotype from Moraballi Creek, 2 mi [3.2 km] east of Essequibo River, 12 mi [38.5 km] south of Bartica, Guyana, in BMNH, lost.
Aranea tubulifaciens:—Roewer, 1942: 854.
Epeirella tubulofaciens:—Mello-Leitão, 1948: 164.
Araneus tubulifaciens:—Bonnet, 1955: 620.

Note. Hingston's illustrations (1932, figs. 40, 41) of *Epeira tubulofaciens* match the web of *M. hoeferi* (Pl. 4). Hingston described this species as having "colour black with a white area in front where base overhangs cephalothorax and a broad white T-shaped mark on the dorsum, the horizontal limb of the T crossing the mid-dorsum transversely and the vertical limb running forward to the center of the base." This description may fit all *Micrepeira* species; however, this is the species found in Guyana (although others may occur there), and Hingston gives the size of 3.1 mm, while the similar, widespread *M. hoeferi* is about 5 mm total length.

A female was examined, which was cited by Mello-Leitão (1948), and is deposited in the BMNH.

I am not following Bonnet (1955) and Roewer (1942) in changing the spelling of "*tubulofaciens*", because Hingston was consistent in spelling the name with an "o".

Description. Female from French Guiana. Cephalothorax light orange, legs slightly dusky, distal ends darkest. Dorsum of abdomen black with gray and white pigment patches (Fig. 185); venter with black band from genital groove to spinnerets and around spinnerets; sides dusky orange. Posterior median eyes same diameter as anterior medians, laterals 0.9 diameter. Anterior median eyes 0.5 diameter apart, 1 diameter from laterals. Posterior median eyes 0.5 diameter apart, 1.1 diameters from laterals. Total length 3.1 mm. Carapace 1.3 mm long, 1.3 wide, 0.7 behind lateral eyes. First femur 1.2 mm, patella and tibia 1.2, metatarsus 0.7, tarsus 0.5. Second patella and tibia 1.1 mm, third 0.6, fourth 1.1.

Variation. Total length of females 3.1 to 3.6 mm. The illustrations were made from a female from French Guiana.

Diagnosis. This species is smaller than *M. hoeferi,* and its epigynum is a large triangle with distinct markings (Fig. 182). It differs from *M. fowleri* by having the black cap on the posterior of the abdomen less distinct (Fig. 185).

Natural History. A retreat measured 5.4 mm wide and 13 mm long. Judging by Hingston's illustrations, the web is similar to that of *M. hoeferi* (Pl. 1). The specimen from French Guiana came with a female of the larger *M. hoeferi* and was collected in forest clearing; the specimen from Canje Ikuruwa River came from forest savanna.

Distribution. Guianas (Map 6).

Specimens Examined. GUYANA Canje Ikuruwa River, 05°30′N, 57°30′W, Aug.–Dec. 1961, 1♀ (G. Bentley, AMNH); Higher Potaro River Distr. 1♀ (R.

Lloyd, BMNH); Kartabo, 1924, 1♀ (AMNH). FRENCH GUIANA Crique Limonade, 3–4 km SW Saúl, 21, 22 Dec. 1972, ♀ (D. Quintero, MCZ); Montagnes Kaw, nr. Camp Calman, ca. 27 km SE Roura, 4°33′N, 52°09′W, 5, 7 Aug. 1988, 2♀ (S. Marshall, USNM).

Micrepeira pachitea new species
Figures 187–191; Map 6

Holotype. Female holotype from Panguana, Río Pachitea, Depto. Huánuco, Peru, 9°37′S, 74°56′W, 1987 (C. Manhart), in MCZ. The specific name is a noun in apposition after the locality.

Description. Female holotype. Carapace orange-brown. Chelicerae, labium, endites, sternum brown. Legs brown. Dorsum of abdomen black with white patches (Fig. 190); venter black with a white transverse band anterior of pedicel. Posterior median eyes 0.8 diameter of anterior medians, anterior laterals 0.8 diameter, posterior 1 diameter. Anterior median eyes 0.7 diameter apart, 2 diameters from laterals. Posterior median eyes 0.8 diameter apart, 2.4 diameters from laterals. Total length 4.8 mm. Carapace 2.3 mm long, 1.9 wide, 1.3 behind lateral eyes. First femur 2.0 mm, patella and tibia 1.9, metatarsus 1.0, tarsus 0.8. Second patella and tibia 1.8 mm, third 1.3, fourth 1.6.

Variation. Total length of females 4.8 to 5.6 mm.

Diagnosis. The sternum of *M. pachitea* has an anterior median groove (Fig. 191) and the epigynum is a broad, wide triangle (Fig. 187).

Natural History. The cone-shaped retreat, preserved with the specimen, is about 7 mm wide and 21 mm long, another is 13 mm long.

Distribution. Peruvian Amazon (Map 6).

Specimens Examined. PERU *Loreto:* Génaro Herrera, 04°55′S, 73°45′W, 28 Aug. 1988, 3♀ (D. Silva D., MUSM). *Madre de Dios:* Zona Reservada Tambopata, 290 m, 14 June 1988, 1♀ (D. Silva D., MUSM).

Micrepeira smithae new species
Figures 192–195; Map 6

Holotype. Female holotype from Voltzberg-Raleighvallen Reserve, 4°45′N, 56°10′W, Surinam, April, May 1984 (D. Smith Trail), in MCZ. The species is named after the collector, arachnologist D. Smith.

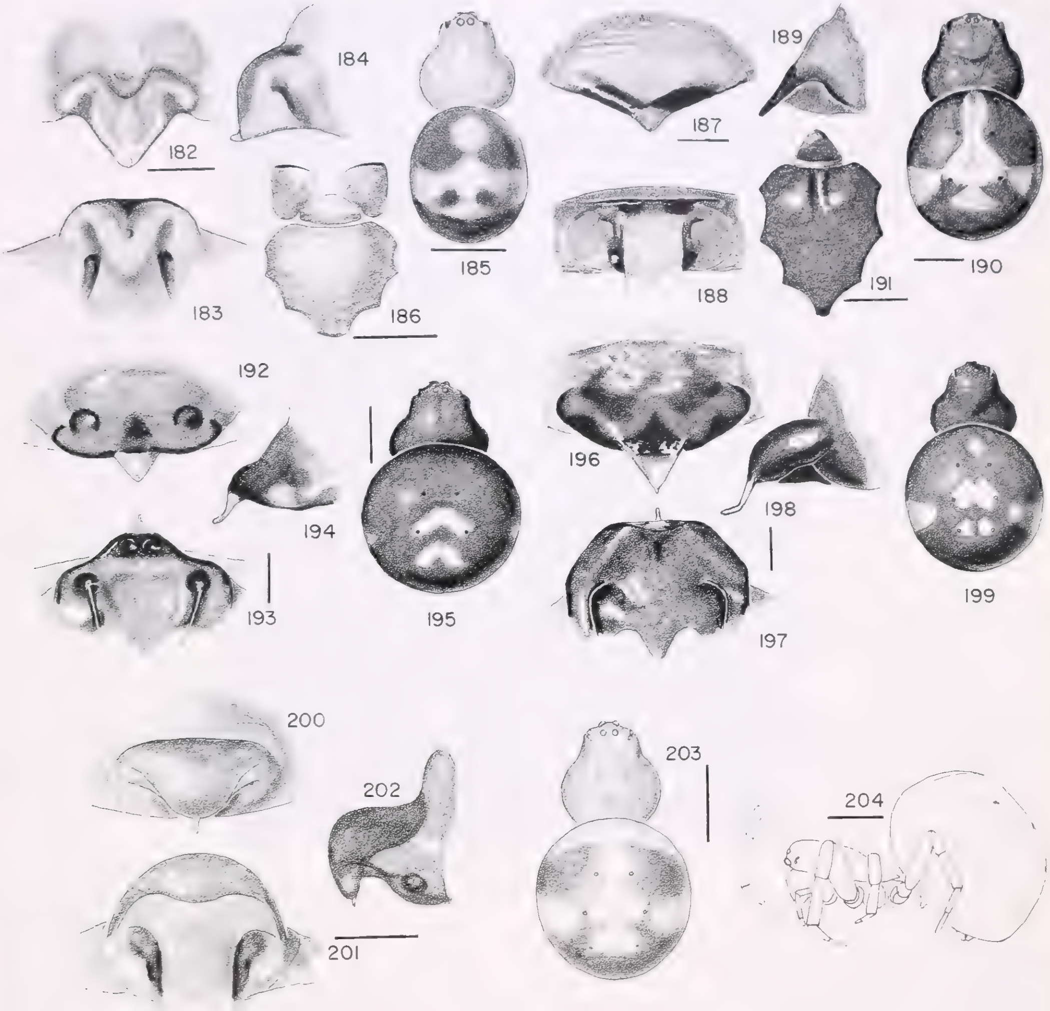
Description. Female holotype. Carapace dark brown. Chelicerae, labium, endites, sternum, dark brown. Legs brown. Dorsum of abdomen black with white chevrons (Fig. 195); venter black, with paired anterior white spots, one lying above each third femur when the spider is in resting position. Posterior median eyes same diameter as anterior medians, anterior laterals 0.8 diameter, posterior laterals 1 diameter. Anterior median eyes their diameter apart, 2 diameters from laterals. Posterior median eyes 0.8 diameter apart, 2.2 wide diameters from laterals. Total length 3.5 mm. Carapace 1.8 mm long, 1.7 wide, 1.1 behind lateral eyes. First femur 1.4 mm, patella and tibia 1.3, metatarsus 0.7, tarsus 0.6. Second patella and tibia 1.3 mm, third 0.9, fourth 1.2.

Diagnosis. The epigynum of *M. smithae* differs from others by having a small triangle at the posterior margin, tapering into a tiny scale (Fig. 192), and by having a wide depressed median plate in posterior view (Fig. 193).

Micrepeira velso new species
Figures 196–199; Map 6

Holotype. Female holotype and immature paratype from Finca La Selva, near Puerto Viejo, Heredia, Costa Rica, Jan. 1978 (W. Eberhard no. 1280), in MCZ. The specific name is an arbitrary combination of letters.

Description. Female holotype. Carapace dark orange-brown. Chelicerae orange-brown. Labium, endites, sternum orange-brown. Legs brown. Dorsum of abdomen black with white patches (Fig. 199); venter black with paired anterior white patches lying above fourth coxae. Eyes subequal in size. Anterior median eyes 0.8 diameter apart, 2.5 diameters from laterals. Posterior median eyes their diameter apart, 2.7 diameters from laterals. Total length 4.7 mm. Carapace 2.1 mm long, 2.0 wide, 1.1 behind lateral eyes. First femur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Figures 182–186. *Micrepeira tubulofaciens* (Hingston), female. 182–184, epigynum. 182, ventral. 183, posterior. 184, lateral. 185, dorsal. 186, sternum.

Figures 187–191. *M. pachitea* n. sp., female. 187–189, epigynum. 187, ventral. 188, posterior. 189, lateral. 190, dorsal. 191, sternum.

Figures 192–195. *M. smithae* n. sp., female. 192–194, epigynum. 192, ventral. 193, posterior. 194, lateral. 195, dorsal.

Figures 196–199. *M. velso* n. sp., female. 196–198, epigynum. 196, ventral. 197, posterior. 198, lateral. 199, dorsal.

Figures 200–204. *M. albomaculata* Schenkel, female. 200–202, epigynum. 200, ventral. 201, posterior. 202, lateral. 203, dorsal. 204, lateral.

Scale lines. 1.0 mm, genitalia 0.1 mm, except Figures 186, 191, 0.5 mm.

1.8 mm, patella and tibia 1.7, metatarsus 0.9, tarsus 0.7. Second patella and tibia 1.6 mm, third 1.2, fourth 1.4.

Diagnosis. This species differs by the triangular median piece of the epigynum overhanging the posterior margin (Fig. 196) and by the raised median posterior plate that overhangs the lateral plates (Fig. 197).

Natural History. The web was at the edge of a clearing and was tattered in the evening, fresh in the morning, suggesting that the spider builds early in the morning. The spider was in a retreat and pulled the sides of the retreat together when disturbed. The web was 28 cm wide (Eberhard, personal communication and photographs); the retreat, collected with the specimen, was 6 mm wide and 11 mm long.

Paratype. COSTA RICA *Heredia:* Sarapiquí nr. Puerto Viejo, Sept. 1981, 1♀ (C. E. Griswold, CAS).

Micrepeira albomaculata Schenkel
Figures 200–204; Map 6

Micrepeira albomaculata Schenkel, 1953: 26, fig. 24, ♀. Female holotype from El Pozón, Depto. Acosta, Est. Falcón, Venezuela, in NMB, examined. Brignoli, 1983: 276.

Description. Female holotype. Carapace dark orange, sides of thoracic region dusky. Chelicerae, labium, endites, sternum orange. Legs dark orange. Dorsum of abdomen black with median and paired white patches (Figs. 203, 204); venter dusky, without white pigment. Chelicerae with two teeth on anterior margin. Eyes subequal. Anterior median eyes 0.8 diameter apart, 1.5 diameters from laterals. Posterior median eyes their diameter apart, 1.5 diameters from laterals. Total length 3.5 mm. Carapace 1.43 mm long, 1.31 wide. First femur 1.01 mm, patella and tibia 1.03, metatarsus 0.57, tarsus 0.52. Second patella and tibia 1.04 mm, third 0.68, fourth 0.96.

Diagnosis. The bulbous median lobe of the epigynum (Fig. 200) and the T-shaped posterior median plate (Fig. 201) separate this species from all other known *Micrepeira* species.

Madrepeira new genus

Type species. Madrepeira amazonica. The name is an arbitrary combination of letters prefixed to "epeira". The name is feminine.

Diagnosis. The genus is close to *Aculepeira, Amazonepeira, Metepeira, Kaira,* and *Tatepeira,* all of which exhibit two known synapomorphies: the pointed scape of the epigynum and the pair of flagella on the median apophysis (M in Fig. 213) of the male palpus. *Madrepeira* differs by the shape of the epigynum, which has lateral and median plates fused into a base and, on each side of the attachment of the scape, a scale formed from the posterior median plate (Figs. 205–208). It also differs from other genera by the diamond-shaped abdomen with paired lateral humps and by having spindly legs with only a few long setae (Fig. 209). The genus also differs in making a ladderweb (Pl. 5), similar to that of *Scoloderus.*

Relationship. Characters that ally this genus to *Araneus* include placement of the conductor (C in Fig. 213), covering the tegulum at the upper right (in the left palpus, at 2–3 hr in Fig. 212), the presence of distal hematodocha (DH) between the embolus (E) and the terminal apophysis (A in Fig. 213), the median apophysis with a distal spine and a proximal pair of flagella (M in Fig. 213), and two palpal patellar macrosetae (at 10 hr in Fig. 216) (the last character sometimes missing in a few species belonging to this group). The female has an annulate scape as do most relatives of *Araneus* (but also *Parawixia* and *Eriophora,* both *Alpaida* relatives).

Natural History. Madrepeira makes a short ladderweb in forests (Pl. 5).

Distribution. There is only one Neotropical species.

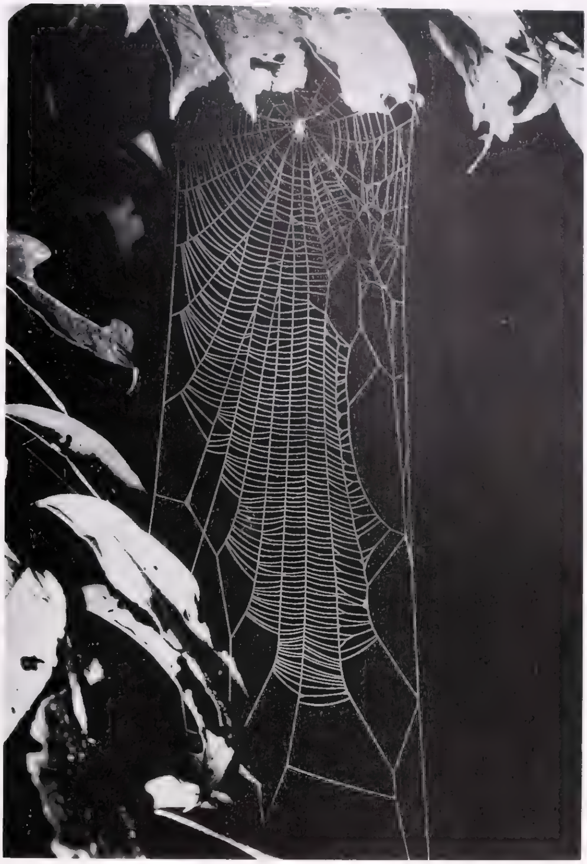
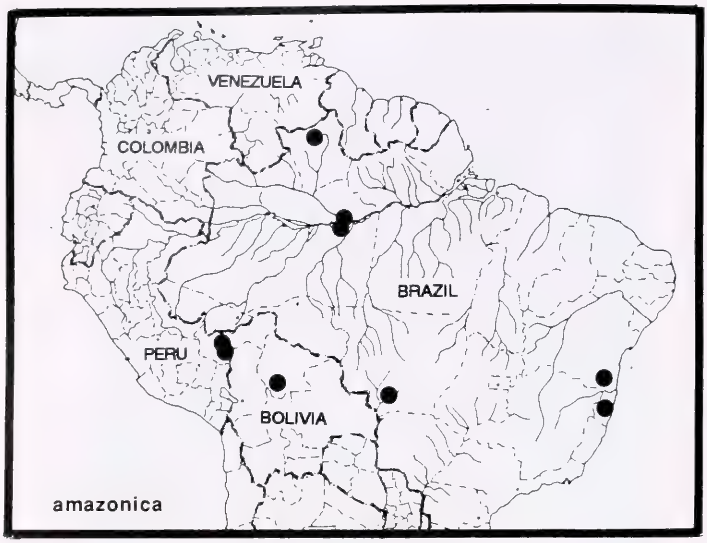


Plate 5. *Madrepeira amazonica* n. sp. Web of an immature, about 5.1 cm wide, 16.5 cm long, calculated from the size of the spider (photo, J. Coddington).

Madrepeira amazonica new species
Plate 5; Figures 205–216; Map 7

Holotype. Male holotype from Albergue "Cuzco Amazonica," 200 m, 12°33′S, 69°03′W, Río Madre de Dios, Depto. Madre de Dios, Peru, 9 Mar. 1990 (D. Silva D.), in MUSM. The specific name is a noun in apposition after the type locality.

Description. Female paratype. Carapace yellowish white with pink on each side of cephalic region. Chelicerae, labium, endites, sternum, legs yellowish white. Dorsum of abdomen with black dots, except for two light patches, one on each side (Fig. 209). Centers of light patches with some pink dots. Sides with a black line bordering the dorsal black spots and the white side of venter; venter yellowish with white on each side. Posterior median eyes 0.5 diameter of anterior medians, anterior laterals 0.6 diameter, posterior laterals 0.5 diameter. Anterior median eyes their diameter apart, their diameter from laterals. Posterior median eyes 1.5 diameters apart, 2.2 diameters from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.4 diameter of anterior median eye. One chelicera with five teeth on anterior margin, other with four teeth; four teeth on one posterior margin, three on other; denticles



Map 7. Distribution of *Madrepeira amazonica.*

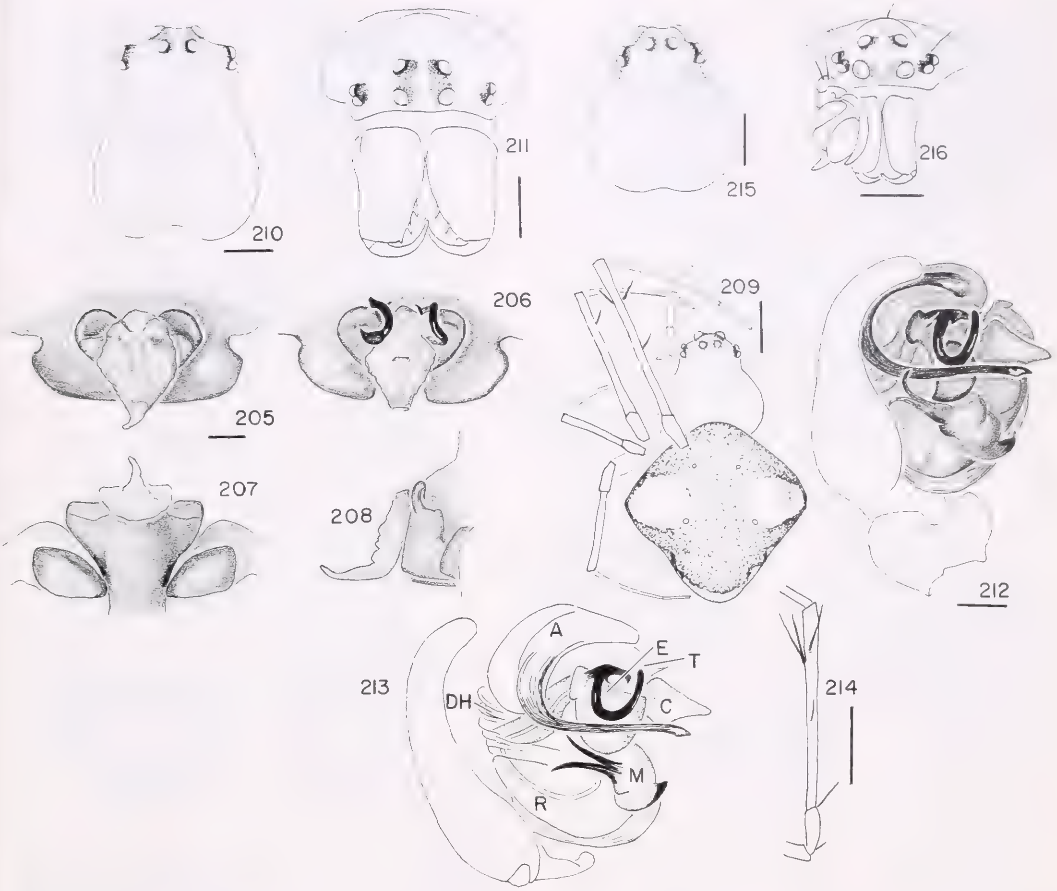
in grooves. Legs spindly with short, fine setae and a few very long, dark macrosetae (Fig. 214). Abdomen diamond-shaped (Fig. 209). Total length 5.0 mm. Carapace 2.1 mm long, 1.7 wide, 1.0 behind lateral eyes. First femur 3.7 mm, patella and tibia 4.2, metatarsus 3.6, tarsus 1.5. Second patella and tibia 3.4 mm, third 1.7, fourth 2.5.

Male holotype. Color as in female. Posterior median eyes 0.5 diameter of anterior medians, anterior laterals 0.5 diameter, posterior laterals 0.4 diameter. Anterior median eyes their diameter apart, 0.3 diameter from laterals. Posterior median eyes their diameter apart, 1.5 diameters from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.2 diameter of anterior median eye. Endite with cone-shaped tooth facing a tubercle on palpal femur. Palpal patella with two macrosetae (Fig. 216). First coxa with a minute hook on distal margin. First tibia with a pair of macrosetae on a slight tubercle (Fig. 214). Second tibia as thick as first, not modified. Abdomen diamond-shaped. Total length 3.0 mm. Carapace 1.43 mm long, 1.30 wide, 0.68 behind lateral eyes. First femur 2.92 mm, patella and tibia 3.32, metatarsus 2.62, tarsus 1.17. Second patella and tibia 2.56 mm, third 1.17, fourth 1.87.

Note. Males and females were matched because they have similar markings and abdomen shape and were collected together. The black horseshoe-shaped appendage of the embolus (Figs. 212, 213) breaks off and stays attached to the epigynum (Fig. 206), perhaps blocking insemination by other males.

Variation. Total length of females 4.7 to 5.8 mm, males 3.0 to 3.5. Illustrations were made from a female paratype and male holotype, except for Figures 210, 211, 215, and 216, which were made from Bolivian specimens. One immature specimen had four white patches across the abdomen, one anterior median patch, and five confluent posterior patches each with a pink center and white outside. Some individuals have black rings on the patella. Others had a red line around the white patches on the abdomen. Eyes of Bolivian specimens are slightly farther apart than those from Peru.

Natural History. Most specimens were obtained by night collecting. Bolivian



Figures 205–216. *Madrepeira amazonica* n. sp. 205–211, female. 205–208, epigynum. 205, ventral. 206, ventral, mated. 207, posterior. 208, lateral, 209, dorsal. 210, carapace. 211, eye region and chelicerae. 212–216, male. 212, 213, left palpus. 212, mesal. 213, pulled apart. 214, first left patella and tibia, prolateral. 215, carapace. 216, eye region, chelicerae, and right palpus.

Abbreviations. A, terminal apophysis. C, conductor. DH, distal hematodocha. E, embolus. M, median apophysis. R, radix. T, tegulum.

Scale lines. 1.0 mm, genitalia 0.1 mm, except Figures 210, 211, 215, 216, 0.5 mm.

specimens were observed in a ladderweb (Pl. 5).

Distribution. Amazon region to southern Mato Grosso, southern Bahia States, Brazil (Map 7).

Paratypes. PERU *Madre de Dios:* Albergue "Cuzco Amaconica", 200 m, Rio Madre de Dios, 16 May–12 June 1989, 4♀, 1♂ (D. Silva D., MUSM, 1♀ in MCZ).

Specimens Examined. PERU *Madre de Dios:* Zona Reservada Tambopata, 30 km SW Puerto Maldonado, 6–14 Sept. 1984, 1♂ (T. L. Erwin et al., USNM). BRAZIL *Roraima:* Ilha de Maracá, Rio Uraricoera, 25 Mar. 1987, 1♀ (A. A. Lise, MCN 20070). *Amazonas:* Lago de José, Manaus, 9 Aug. 1987, 1♀ (J. Adis, MCN 20071); Rio Tarumã, Mirím, Manaus, 30 July 1979, 1 imm. (J. Adis et al., MCN 20054). *Bahia:* Fazenda Nossa Senhora das Neves, Itamarajú, 9 Oct. 1978, 1 ♂ (J. S. Santos, MCN 11089); Fazenda Matiapã, Camacan, 16 Oct. 1978, 1♀ (J. S. Santos, MCN 11113). *Mato Grosso:* Poconé, Fazenda Santa Inés, Pantanal, 5–11 Aug. 1992, 3 imm, 1♂ (A. A. Lise, A. Braul, MCP 2362). BOLIVIA *Beni:* Station Biologica Beni, on trail betw. Zones 1 & 2, 12 Sept. 1987, 1♀ (J. Coddington, USNM).

Tatepeira new genus

Type species. Aranea tatarendensis Tullgren, 1905. The name is an arbitrary combination of letters, prefixed to "epeira"; its gender is feminine.

Diagnosis. Tatepeira is close to *Aculepeira, Amazonepeira, Madrepeira, Metepeira,* and *Kaira,* all of which have a pointed scape on the epigynum (Figs. 217–219) and, in the male, a pair of flagella on the median apophysis (M in Fig. 224). *Tatepeira* differs from these genera by having a pair of large dorsal humps on the abdomen (Figs. 220, 227, 234, 238). (*Aculepeira visite* Levi, 1991a, does have humps on the abdomen and may belong here.) The type species *T. tatarendensis* has the scape of the epigynum on a pedestal (Figs. 217–219), making the epigynum longer than wide as seen from the side (Fig. 219).

Note. Three of the four species are placed here tentatively: *Tatepeira itu* lacks a terminal apophysis and the distal hematodocha in the palpus (Figs. 229, 230). *Tatepeira stadelmani* and *T. carrolli* are similar to each other, but until their males are known their generic placement is uncertain. Before I revised *Kaira* (Levi, 1993c), I considered these two to belong to *Kaira,* but the distal articles of the legs are not as curved and spinose as in species of *Kaira.*

Relationship. The pointed scape of the epigynum (Figs. 217, 225) and the two flagella on the median apophysis (M in Fig. 224) relate *Tatepeira* to *Aculepeira, Amazonepeira, Madrepeira, Metepeira,* and *Kaira.* These genera, as others related to *Araneus* and *Neoscona,* has the palpus with distal hematodocha (DH in Fig. 224), the conductor is near the edge of the tegulum below the arrow-shaped tip of the terminal apophysis (Fig. 223, C in Fig. 224), and there are two setae on the palpal patella.

Natural History. The web is not known for any of the species.

Distribution. All four species are Neotropical.

KEY TO SPECIES HERE PLACED IN *TATEPEIRA*

The males of *T. stadelmani* and *T. carrolli* are not known.

1. Female 3
– Male 2
2(1). Palpal flagella attached to distal end of median apophysis of palpus and median apophysis without row of teeth (Figs. 222, 223, M in Fig. 224); widespread (Map 8) .... *tatarendensis*
– Flagella on proximal end of median apophysis, distal end with teeth (Figs. 229, 230); southern Brazil (Map 8) .... *itu*
3(1). Scape of epigynum on a pedestal (Figs. 217–219); widespread (Map 8) .... *tatarendensis*
– Epigynum flat (Figs. 225, 226, 231–233, 235–237) 4
4(3). Abdomen humps facing dorsally (Fig. 227); total length less than 4 mm; southern Brazil (Map 8) .... *itu*
– Large humps facing laterally (Figs. 234, 238); total length more than 5 mm 5
5(4). In posterior view of epigynum, only lateral plates sclerotized and lateral plates with a ventral concave notch (Fig. 232); Honduras (Map 8) .... *stadelmani*
– In posterior view of epigynum, median plates sclerotized and ventrally curled (Fig. 236); Colombia (Map 8) .... *carrolli*

Tatepeira tatarendensis (Tullgren) new combination

Figures 217–224; Map 8

Aranea tatarendensis Tullgren, 1905: 34, pl. 5, fig. 12, ♀. Female holotype from Tatarenda [Depto. Tarija, 600 m, northeast of Aguairenda, 21°50′S, 63°37′W, on border between tropical forest and dry woods (Paynter, 1993)], Bolivia, in NRMS, examined. Roewer, 1942: 853.

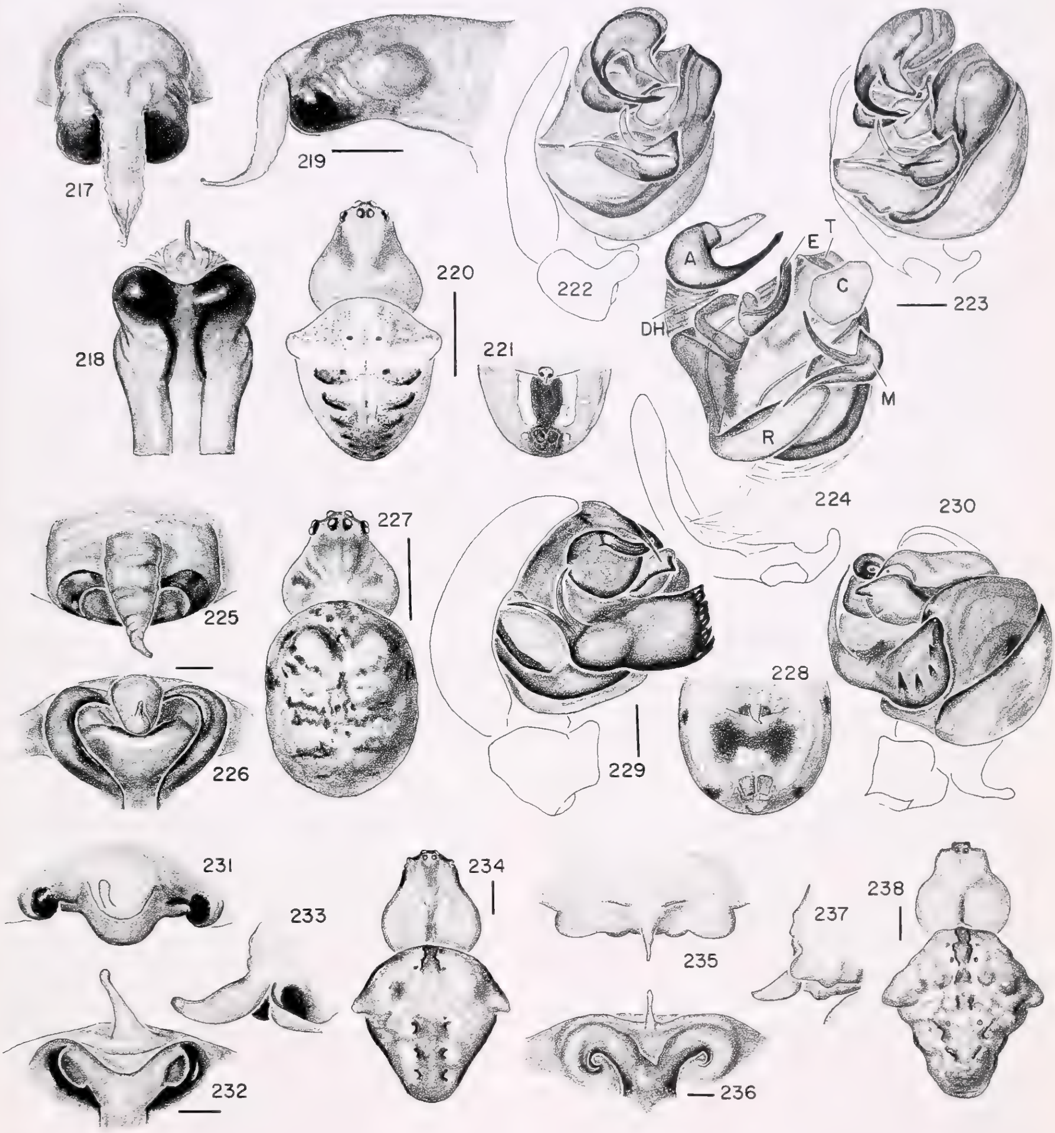
Araneus holmi Caporiacco, 1955: 354, fig. 34, ♀. Female holotype from Maiquetía, Distr. Federal, Venezuela, in UCVC. NEW SYNONYMY.

Araneus tatarendensis:—Bonnet, 1955: 609.

Araneus akeholmi Brignoli, 1983: 252. New name for *A. holmi,* preoccupied. NEW SYNONYMY.

Wixia tatarendensis:—Levi, 1991b: 177.

Description. Female from northern Colombia. Carapace yellowish white, dusky on each side of head, and carapace underlain by a white pigment patch. Carapace lightly sclerotized, without setae, not shiny. Chelicerae orange. Labium, endites dusky. Sternum black, lightest in center. Coxae yellowish white; legs yellowish.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Figures 217–224. *Tatepeira tatarendensis* (Tullgren). 217–221, female. 217–219, epigynum. 217, ventral. 218, posterior. 219, lateral. 220, dorsal. 221, abdomen, ventral. 222–224, left male palpus. 222, mesal. 223, ventral. 224, pulled apart.

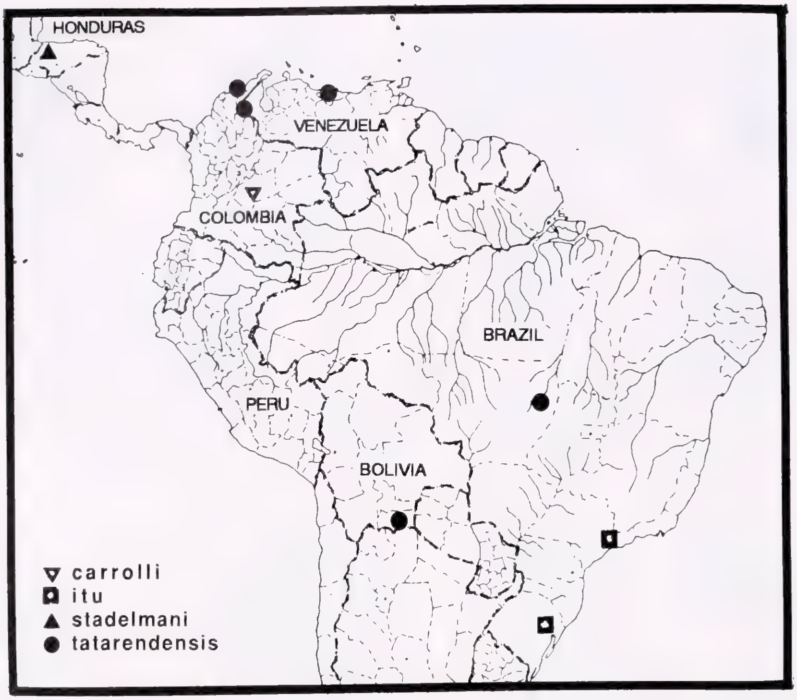
Figures 225–230. *T. itu* n. sp. 225–228, female. 225–226, epigynum. 225, ventral. 226, posterior. 227, dorsal. 228, abdomen, ventral. 229, 230, palpus. 229, mesal. 230, ventral.

Figures 231–234. *T. stadelmani* n. sp., female. 231–233, epigynum. 231, ventral. 232, posterior. 233, lateral. 234, dorsal.

Figures 235–238. *T. carrolli* n. sp., female. 235–237, epigynum. 235, ventral. 236, posterior. 237, lateral. 238, dorsal.

Abbreviations. A, terminal apophysis. C, conductor. DH, distal hematodocha. E, embolus. M, median apophysis. R, radix. T, tegulum.

Scale lines. 1.0 mm, genitalia 0.1 mm.



Map 8. Distribution of *Tatepeira* species.

Dorsum of abdomen white with pairs of curved black lines approaching each other posteriorly, and dusky spotted areas (Fig. 220); venter black between epigynum and spinnerets with a wide, white, longitudinal streak on each side and a white spot on each side of black spinnerets (Fig. 221). Posterior median eyes 1.3 diameters of anterior medians, laterals same diameter as anterior medians. Anterior median eyes 1 diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.8 diameter apart, 2.2 diameters from laterals. Ocular quadrangle square. Height of clypeus equals 0.5 diameter of anterior median eye. Abdomen slightly longer than wide with anterolateral humps (Fig. 220). Total length 2.9 mm. Carapace 1.6 mm long, 1.2 mm wide, 0.7 behind lateral eyes. First femur 1.5 mm, patella and tibia 1.8, metatarsus 1.3, tarsus 0.6. Second patella and tibia 1.7 mm, third 0.9, fourth 1.5.

Male from northern Colombia. Color as in female. Carapace with longitudinal median line in thoracic region. Posterior median eyes same diameter as anterior medians, laterals 0.8 diameter. Anterior median eyes their diameter apart, 1.5 diameters from laterals. Posterior median eyes 0.8 diameter apart, 2 diameters from laterals. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.8 diameter of anterior median eye. Endite with tooth, palpal femur with facing tubercle. Palpal patella with two macrosetae. First coxa with large hook. Second tibia thicker than first, swollen, and with prolateral macrosetae. Abdomen oval without humps. Total length 3.4 mm. Carapace 1.5 mm long, 1.4 wide, 0.7 behind lateral eyes. First femur 2.2 mm, patella and tibia 2.4, metatarsus 1.6, tarsus 0.7. Second patella and tibia 1.6 mm, third 1.1, fourth 1.8.

Note. Males and females were paired on the basis of matching genitalia, the epigynum having a pointed scape and the median apophysis of the male a pair of flagella. Also, both have a similar coloration and black rings around the eyes. They were collected near each other.

Variation. Total length of males 2.9 to 3.4 mm. Most males have a dorsal folium on the abdomen. The illustrations were made from individuals from northern Colombia.

Diagnosis. *Tatepeira tatarendensis* is separated from other species placed in this genus by the epigynum, which has the scape on a pedestal (Figs. 217–219), and by the median apophysis of the male, which has a pair of flagella on its distal end (Figs. 222–224).

Natural History. Males were collected in the herb layer in Colombia, in campo-grassland in Mato Grosso, Brazil.

Distribution. Northern Colombia to southern Bolivia and Mato Grosso, Brazil (Map 8).

Specimens Examined. COLOMBIA *Magdalena:* Bahia Concha, Tayrona Park, 10 km E Santa Marta, from low vegetation, 23 June 1985, 1♀ (H.-G. Müller, SMF 36900); Villa Culebra nr. Bonda, 10 km E Santa Marta, Oct. 1985, 3♂, 1 imm. (H.-G. Müller, SMF, MCZ); 1–11 Nov. 1985, 1♂ (H.-G. Müller, SMF). *César:* Velledupar, 4–9 June 1968, 1♂ (B. Malkin, AMNH). BRAZIL *Mato Grosso:* 260 km N Xavantina, 12°49′S, 51°46′W, 400 m, Feb.–Apr. 1969, 1♂ (Xavantina-Cachimbo Exped., MCZ).

Tatepeira itu new species
Figures 225–230; Map 8

Holotype. Female holotype from Fazenda Pau d'Alho, Municipio de Itu, São Paulo State, Brazil, 2 Feb. 1959 (F. Lane), in AMNH. The specific name is a noun in apposition after the type locality.

Description. Female holotype. Carapace yellowish with dusky patches, white pigment underneath center of thoracic area and black rings around eyes. Chelicerae yellowish, proximally dusky. Labium dusky, endites yellow-white. Sternum dusky orange. Coxae yellowish; legs yellowish with narrow brownish to black rings. Dorsum of abdomen white with black patches (Fig. 227); venter with a pair of black patches with some white pigment posteriorly and to sides (Fig. 228). Posterior median eyes 1.3 diameters of anterior medians, anterior laterals 0.9, posterior laterals 1.2 diameters. Anterior median eyes their diameter apart, 1 diameter from laterals. Posterior median eyes 1.5 diameters apart, 1.5 diameters from laterals. Ocular quadrangle wider behind than in front. Height of clypeus equals 0.2 diameter of the anterior median eye. Abdomen oval (shrivelled), with two humps (Fig. 227). Total length 3.4 mm. Carapace 1.41 mm long, 1.36 wide, 0.85 wide behind lateral eyes. First femur 1.62 mm, patella and tibia 2.31, metatarsus 1.39, tarsus 0.58. Second patella and tibia 1.82 mm, third 1.11, fourth 1.45.

Male paratype. Color as in female. Posterior median eyes 1.3 diameters of anterior medians, laterals 0.9 diameter. Anterior median eyes 2 diameters apart, 2 diameters from laterals. Posterior median eyes 1.2 diameters apart, 1.5 diameters from laterals. Ocular quadrangle slightly wider behind than in front. Height of clypeus equals 0.2 diameter of the anterior median eye. Endite without tooth. Palpal patella without macroseta. First coxa without hook. Second tibia as thick as first. Abdomen as in female. Total length 3.0 mm. Carapace 1.45 mm long, 1.27 wide, 0.75 wide behind lateral eyes. First femur 1.78 mm, patella and tibia 1.98, metatarsus 1.22, tarsus 0.52. Second patella and tibia 1.78 mm, third 0.94, fourth 1.29.

Note. Males and females were matched on the basis of their genitalia, the epigynum with a pointed scape, and the median apophysis with a pair of flagella. Also, they have a similar abdomen shape and similar markings. The species is tentatively placed in *Tatepeira.*

Diagnosis. The heart-shaped frame around the epigynum (Figs. 225, 226) and the shape and armature of the median apophysis separate *T. itu* from other species with similar genitalia. Unlike similar species, the palpus lacks a terminal apophysis and distal hematodocha (Figs. 229, 230).

Paratype. BRAZIL *São Paulo:* Jabaquara, Cidade São Paulo, 21 Dec. 1945, 1♂ paratype (H. Sick, AMNH).

Specimens Examined. BRAZIL *Rio Grande do Sul:* Montenegro, 15 Nov. 1977, 1♀ (H. Buckup, MCN 7535).

Tatepeira stadelmani new species
Figures 231–234; Map 8

Holotype. Female holotype from Subirana, Depto. Yoro, Honduras, no date (Stadelman), in MCZ. The species is named after the collector.

Description. Female holotype. Carapace orange with darker orange spots and a median longitudinal gray line; clypeus black. Black band covering anterior median eyes, branching on each side, with upper branch covering lateral eyes, lower covering edge of cephalic region. Chelicerae orange, with darker spots and patches. Labium, endites dusky brown. Sternum brown, lighter in middle toward labium. Coxae orange, mottled brown; legs orange, with irregular narrow brown rings. Dorsum of abdomen white with indistinct posterior gray folium; folium as wide in front as behind, bordered by pairs of reverse parentheses (Fig. 234). Sides with longitudinal black line, which stops abruptly toward dorsum and fades toward venter. Venter colorless with a pair of faint white lines. Dorsum of carapace with a circular thoracic depression. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.6 diameter. Anterior median eyes 0.9 diameter apart, 1.5 diameters from laterals. Posterior median eyes their diameter apart. Ocular quadrangle narrower behind than in front. Height of clypeus equals 0.6 diameter of anterior median eye. Abdomen with pair of lateral humps (Fig. 234). Total length 7.5 mm. Carapace 3.4 mm long, 2.7 wide, 1.5 behind lateral eyes. First femur 4.5 mm, patella and tibia 5.6, metatarsus 3.4, tarsus 1.4. Second patella and tibia 4.9 mm, third 2.7, fourth 3.8.

Note. The abdomen of the holotype is shrivelled and damaged.

Diagnosis. *Tatepeira stadelmani* is similar to *T. carrolli* but differs in having a circular thoracic depression and an epigynum having sclerotized lateral plates with a wide ventral notch in posterior view (Fig. 232).

Tatepeira carrolli new species
Figures 235–238; Map 8

Holotype. Female holotype from Lomalinda, 03°18′N, 73°22′W, near Puerto Lleras, 300 m, grasslands "with patches of jungle and marsh", Depto. Meta, Colombia, 13 Apr. 1986 (B. T. Carroll), in MCZ. The species is named after the collector.

Description. Female holotype. Carapace yellowish with irregular dusky marks, area between median eyes and clypeus gray, indistinctly branching on sides as in *T. stadelmani.* A dark mark in deep, longitudinal thoracic groove. Labium, endites dusky yellow. Sternum dusky yellow with median white streak. Coxae, legs yellowish with indistinct narrow dark rings. Dorsum of abdomen whitish with dusky marks; folium widest in front (Fig. 238); sides with a distinct longitudinal black line fading toward venter; venter with little pigment, a dusky white square between epigynum and spinnerets. Posterior median eyes 0.8 diameter of anterior medians, laterals 0.7 diameter. Anterior median eyes 1.3 diameters apart, 2.1 diameters from laterals. Posterior median eyes 1.2 diameters apart. Ocular quadrangle narrower behind than in front. Height of clypeus equals diameter of anterior median eye. Abdomen with pair of lateral humps and two more pairs of dorsal humps in a line between big humps, also pairs of smaller bulges on sides posteriorly (Fig. 238). Total length 10.5 mm. Carapace 5.2 mm long, 4.5 wide, 2.2 behind lateral eyes. First femur 7.0 mm, patella and tibia 8.4, metatarsus 5.5, tarsus 2.0. Second patella and tibia 8.0 mm, third 4.0, fourth 6.2.

Diagnosis. *Tatepeira carrolli* is similar to *T. stadelmani* but differs by having a longitudinal groove in the thoracic region (Fig. 238) and by having the epigynum with the posterior median plate sclerotized and elevated above the lateral plates, its ventral borders curling toward the sides (Fig. 236).

NOTE

In 1929, Major R. W. G. Hingston (who previously had published 10 books and papers on spiders, as cited in Bonnet, 1945) led an expedition to British Guiana. He had previously been on expeditions to tropical Asia. The 3-month expedition to Guyana included 12 Europeans and 12 Indians. They collected from treetops by climbing trees with spike ladders, spiked boots, pulleys, and observation chairs. A report on this expedition was published by Hingston in 1932 (*A Naturalist in the Guiana Forest*).

Hingston's volume contains 84 pages on the expedition and 151 pages on spider webs and protective adaptations of spiders. Various chapters describe protective and warning devices of insects, especially ants, termites, and caterpillar cases, and nest suspensions of birds and spiders. A chapter on tree roofs reports collecting 2,000 insects. It is stated that all specimens are deposited in the British Museum, Natural History (Natural History Museum, London, England), but the spiders have not been found.

Most important, Hingston includes an appendix of new spider species found. Unable to find a specialist to help him determine species, he gave new names to the spiders observed. Twenty-seven spiders are named and described, and these names are listed in the catalogs of Roewer (1942) and in Bonnet (1955, 1958, 1959). It has been difficult to interpret Hingston's half-page descriptions without specimens. He did not often describe genitalia or other species-specific characters; however, the spiders' webs are illustrated in earlier chapters. Some species and webs are small and appear to be immature. Evidence for this occurs in the descriptions of three new species of *Argiope,* where he records the stabilimenta of immatures (Levi, 1968: 346). The symmetrical webs illustrated were drawn by Hingston with a ruler and may not depict species-specific characters. But some of the webs give information that (along with the description of coloration of the specimens) provides clues for matching Hingston's names with specimens more recently collected in the Guianas. A list of names and synonymies are given here:

Epeira moraballii (pp. 171, 172, 363) is *Metazygia dubia* (Keyserling) (Levi, 1995).

E. folisecens (pp. 167–170, 364) is *Hingstepeira folisecens* (see Description section of this species).

E. sacculifaciens (pp. 153–155, 364) may be imm. *Micrepeira tubulofaciens* (see Description section of this species).

E. lodiculafaciens (pp. 157–159, 365) is a *Cyrtophora* sp.

E. davisi (pp. 146–149, 365) is *Spilasma duodecimguttata* (Keyserling) (see Description section of this species).

E. tubulofaciens (pp. 150–153, 366) is *Micrepeira tubulofaciens* (see Description section of this species).

E. essequibensis (pp. 182, 183, 366) is the male of *Eustala* sp.

E. nidificans (pp. 173, 174, 367) is probably an immature *Eriophora fuliginea* (C. L. Koch).

E. foliplicans (pp. 175, 176, 367) might be an *Eriophora.*

Turckheimia moraballii (pp. 171–175, 200, 368) is *Parawixia kochi* (Taczanowski). NEW SYNONYMY.

T. tuberculata (pp. 178, 369) is *Parawixia kochi* (Taczanowski). NEW SYNONYMY.

Argiope filiargentata, A. cuyunii, and *A. filiinfracta* are *A. argentata* (Levi, 1968).

Epeira nidificans is 8 mm long, the abdomen a little longer than wide, with three pale yellow bands, the ventral area with a conspicuous quadrate black area. The ventral dark area suggests that the species is an *Eriophora,* probably *E. fuliginea.*

Epeira foliplicans is a relatively large species, 12 mm total length. However, unlike species of *Araneus* and *Eriophora* it has a median light band on the underside of the abdomen, and because it has a retreat it is probably not a *Eustala.*

The species of the genus *Turckheimia* are misplaced, as this name is a synonym of *Cyclosa.* The description of the tubercles on the abdomen places the two species in *Parawixia kochi,* a common species in Guyana.

I have not attempted to place Hingston's six species described in *Cyclosa,* because Neotropical species of that genus still have to be revised.

LITERATURE CITED

ARCHER, A. F. 1971. Especies Nuevas de Argiopidos Peruanos. Revista Peruana Entomologia Agricola, Lima, **14:** 157–159.

BADCOCK, H. D. 1932. Reports of an expedition to Paraguay and Brazil in 1926–1927. Journal of the Linnean Society (Zoology), London, **38:** 1–48.

BANKS, N. 1929. Spiders from Panama. Bulletin of the Museum of Comparative Zoology, **69:** 53–96.

BONNET, P. 1945. Bibliographia Araneorum. Toulouse, **1:** 1–832.

———. 1955. Bibliographia Araneorum. Toulouse, **2**(1): 1–918.

———. 1958. Bibliographia Araneorum. Toulouse, **2**(4): 3027–4230.

———. 1959. Bibliographia Araneorum. Toulouse, **2**(5): 4231–5058.

BRIGNOLI, P. 1983. A Catalogue of the Araneae Described between 1940 and 1981. Manchester: Manchester Univ. Press. 755 pp.

BUTLER, A.G. 1873. A list of spiders of the genus *Acrosoma*, with descriptions of new species. Proceedings of the Scientific Meetings of the Zoological Society of London for the Year 1873, 420–429.

CAMBRIDGE, O. P.-. 1889–1902. Arachnida, Araneidea, **1:** 1–317. *In* Biologia Centrali-Americana, Zoologia, London.

CAPORIACCO, L. DI. 1947. Diagnosi preliminari di specie nuove di Aracnidi della Guiana Brittanica. Monitores Zoologico Italiano, **56:** 20–34.

———. 1948. Arachnida of British Guiana collected by Prof. Beccari. Proceedings of the Zoological Society of London, **118:** 607–747.

———. 1955. Estudios sobre los Arachnidos de Venezuela, 2 Parte: Araneae. Acta Biologica Venezuelica, Universidad Central, **1:** 265–448.

CARTER, G. S. 1928. A naturalist's journey in South America. Proceedings of the Royal Philosophical Society of Glasgow, **56:** 82–107.

CHAMBERLIN, R. V., AND W. IVIE. 1936. New spiders from Mexico and Panama. Bulletin of the University of Utah, Biological Series, **27**(5): 1–103.

CHRYSANTHUS, P. 1969. Spiders from South New Guinea, VI. Nova Guinea (N. S. Zool.), **28:** 87–104.

GLUECK, S. 1994. A taxonomic revision of the orb-weaver genus *Acacesia* (Araneae: Araneidae). Psyche, **101:** 59–84.

GÖLDI, E. A. 1892. Zur Orientierung in der Spinnenfauna Brasiliens. Mitteilungen aus dem Osterlande (Neue Folge), **5:** 200–248.

GRASSHOFF, M. 1971. Die Tribus Mangorini, IV. Die Mangora Gruppe. Senckenbergiana Biologica, **52:** 293–311.

HASSELT, A. W. M, VAN. 1882. Araneae in Veth, P. J. Midden Sumatra, iv. 3rd Aflev. Naturlijke Historie, Leiden, 1–56.

HINGSTON, R. W. G. 1932. A Naturalist in the Guiana Forest. London: Arnold & Co. 348 pp.

HOLMBERG, E. L. 1876. Aracnidos Argentinos. Anales de Agricultura, **4:** 143 (p. 21 in a separate?; see Holmberg, 1883).

———. 1883. Géneros y especies de Arácnidos argentinos nuevos ó poco conocidos. Anales de la Sociedad Científica Argentina, **15:** 232–239.

IAMAT. 1992. World Schistosomiasis Risk Chart. Guelph, Ontario: International Association for Medical Assistance to Travelers.

KEYSERLING, E. 1864. Beschreibung neuer und wenig bekannter Arten aus der Familie Orbitelae Latrl. oder Epeiridae Sund. Sitzungs-Berichte der naturwissenschafftlichen Gesellschaft Isis, Dresden, **1863:** 63–98, 119–154.

———. 1880. Neue Spinnen aus Amerika. Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, **29:** 293–350.

———. 1881. Neue Spinnen aus Amerika. Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, **30:** 547–582.

———. 1883. Neue Spinnen aus Amerika. Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien, **32:** 195–226.

———. 1892–93. Die Spinnen Amerikas, Epeiridae. Nürnberg, **4:** 1–377.

LEVI, H. W. 1968. The spider genera *Gea* and *Argiope* in America (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **136:** 319–352.

———. 1975. Additional notes on the orb-weaver genera *Araneus, Hypsosinga* and *Singa* north of Mexico (Araneae, Araneidae). Psyche, **82:** 265–274.

———. 1976. The orb-weaver genera *Verrucosa, Acanthepeira, Wagneriana, Acacesia, Wixia, Scoloderus* and *Alpaida* north of Mexico (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **147:** 351–391.

———. 1983. The orb-weaver genera *Argiope, Gea* and *Neogea* from the Western Pacific Region (Araneae: Araneidae, Argiopinae). Bulletin of the Museum of Comparative Zoology, **150:** 247–338.

———. 1985. The spiny orb-weaver genera, *Micrathena* and *Chaetacis* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **150:** 429–615.

———. 1988. The Neotropical orb-weaving spiders of the genus *Alpaida* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **151:** 365–487.

———. 1991a. The American species of the orb-weaver genus *Carepalxis* and the new genus *Rubrepeira* (Araneae: Araneidae). Psyche, **98:** 251–264.

———. 1991b. The Neotropical and Mexican species of the orb-weaver genera *Araneus, Dubiepeira* and *Aculepeira* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **152:** 167–315.

———. 1991c. The Neotropical orb-weaver genera

Edricus and *Wagneriana* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **152:** 363–415.

———. 1993a. The Neotropical orb-weaving spiders of the genera *Wixia, Pozonia* and *Ocrepeira* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **153:** 47–141.

———. 1993b. The new orb-weaver genus *Lewisepeira* (Araneae: Araneidae). Psyche, **100:** 127–136.

———. 1993c. The orb-weaver genus *Kaira* (Araneae: Araneidae). The Journal of Arachnology, **21:** 209–225.

———. 1995. The Neotropical orb-weaver genus *Metazygia* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **154:** 63–152.

LOPEZ, A. 1985. Documents originaux, observations des Membres une nouvelle araignee de la Guyane Francaise: *Spilasma richei* n. sp. (Araneidae). Bulletin de la Societé d'études des sciences naturelles de Béziers, **10:** 86, 87.

LUBIN, Y. D. 1978. Seasonal abundance and diversity of web-building spiders in relation to habitat structure on Barro Colorado Island, Panama. Journal of Arachnology, **6:** 31–51.

MELLO-LEITÃO, C. F. DE. 1940. Aranhas do Espírito Santo coligidas por Mario Rosa em 1936 e 1937. Arquivos Zoologia do Estado São Paulo, **2**(5): 199–214.

———. 1943. Catálogo das Aranhas do Rio Grande do Sul. Arquivos do Museu Nacional, **37:** 149–245.

———. 1944. Arañas nuevas de la Provincia de Buenos Aires. Revista del Museo de La Plata (Nueva Serie) Zoología, **3:** 311–393.

———. 1948. Contribuição ao conhecimento da Fauna Araneológica da Guianas. Anais da Academia Brasileira de Ciencias, **20:** 151–196.

MILLIDGE, A. F. 1991. Further Linyphiid spiders (Araneae) from South America. Bulletin of the American Museum of Natural History, **205:** 1–199.

PAYNTER, R. A. 1993. Ornithological Gazetteer of Bolilvia, 2nd ed. Cambridge: Museum of Comparative Zoology. 247 pp.

PERTY, M. 1833. Arachnides Brasiliensis, pp. 191–209. *In* J. B. Spix and F. P. Martius (eds.), Delectus Animalium Articulatorum quae in itinere per Braziliam ann. 1817 et 1820 colligerunt, Monachii.

PLATNICK, N. I. 1989. Advances in Spider Taxonomy 1981–1987. Manchester: Manchester Univ. Press. 674 pp.

———. 1993. Advances in Spider Taxonomy 1988–1991. New York: New York Entomological Society. 846 pp.

QUINTERO, D. 1974. The unusual web of *Spilasma tubulofaciens,* with taxonomic notes on the species (Araneae: Araneidae). Psyche, **81:** 307–314.

ROEWER, C. F. 1942. Katalog der Araneae von 1758 bis 1940. Bremen, **1:** 1–1040.

SCHENKEL, E. 1953. Bericht über einige Spinnentiere aus Venezuela. Verhandlungen der Naturforschenden Gesellschaft, Basel, **64:** 1–57.

SIMON, E. 1895. Histoire Naturelle des Araignées. Paris, **1:** 761–1084.

———. 1897. Descriptions d'espèces nouvelles de l'ordre des Araneae. Annales de la Société Entomologique de France, **65:** 465–509.

———. 1903. Arachnides de la Guinée espagnole. Memorias de la Real Sociedad Española de Historia Natural, Madrid, **1**(3): 65–124.

———. 1908. Etude sur les Arachnides du Tonkin. Bulletin Scientifique de la France et de la Belgique, **42:** 69–147.

STEPHENS, L., AND M. A. TRAYLOR. 1983. Ornithological Gazetteer of Peru. Cambridge: Museum of Comparative Zoology. 273 pp.

———. 1985. Ornithological Gazetteer of the Guianas. Cambridge: Museum of Comparative Zoology. 121 pp.

THORELL, T. 1860. Nya exotiska Epeirider. Öfversigt af Konglige Vetenskaps-Akademiens Förhandlingar, **16:** 299–304.

———. 1868. Araneae. Species Novae Minusve Cognitae Descriptae. *In* C. A. Virgin (ed.), Kongliga Svenska Fregatten Eugenies Resa omkting Jorden, Zoologi. Arachnid, **1:** 1–34.

———. 1890. Studi sui Ragni Malesi e Papuani part iv. Annali del Museo Civico di Storia Naturale di Genova (2), **8:** 1–419.

———. 1895. Descriptive Catalogue of the Spiders of Burma. London: British Museum. 406 pp.

———. 1899. Araneae Camerunensis quas anno 1891 collegerunt Cel. Dr. Y. Sjöstedt aliique. Bihang Svenska Vetenskaps-Akademiens Handlingar, Stockholm, **25:** 1–105.

TULLGREN, A. 1905. Araneida from the Swedish expedition through the Gran Chaco and the Cordilleras. Arkiv für zoologi, Stockholm, **2:** 1–81.

UNITED STATE DEPARTMENT OF INTERIOR. 1968. Argentina. Washington, DC: Office of Geography. Gazetteer no. 103.

VINSON, A. 1863. Aranéides des îles de la Réunion, Maurice et Madagascar. Paris. 337 pp.

WALCKENAER, C. A. 1841. Histoire naturelle des insectes. Aptères. Paris, **2:** 1–548.

YAGINUMA, T. 1986. Spiders of Japan in Color, new ed. Osaka: Hoikusha Publ. Co. 305 pp.

YIN, C. M., J. F. WANG, L. P. XIE, AND X. J. PENG. 1990. New and Newly Recorded Species of the Spiders of the Family Araneidae from China (Arachnida, Araneae) in Spiders of China: One Hundred New and Newly Recorded Species of the Families Araneidae and Agelenidae. Hunan: Hunan Univ. Press. 171 pp.

ZAPFE, H. 1957. *Araneus pentacantha* Walckenaer en la sabana de Bolivia. Investigaciones Zoológicas Chilenas, **4:** 29–31.

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Lyman, C. P., and A. R. Dawe (eds.), 1960. Proceedings of the First International Symposium on Natural Mammalian Hibernation. (*Bulletin of the M.C.Z.*, Vol. 124.)

Ornithological Gazetteers of the Neotropics (1975–).

Peters' Check-list of Birds of the World, vols. 1–16.

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PELEGRINA FRANGANILLO AND OTHER JUMPING SPIDERS FORMERLY PLACED IN THE GENUS *METAPHIDIPPUS* (ARANEAE: SALTICIDAE)

WAYNE P. MADDISON[1]

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ABSTRACT. The genus *Pelegrina* Franganillo contains 38 species of dendryphantine jumping spiders from North and Central America that were formerly placed in the genus *Metaphidippus* F. O. Pickard-Cambridge. The close relatives of the Dendryphantinae may include the Europhryinae and several smaller groups, for they share an embolus that is coiled counterclockwise (left palp) and separated from the tegulum by a fully expandable hematodocha. The subfamily Dendryphantinae itself is delimited by the derived conditions of a carina on the underside of the male chelicera, the coil of the embolus folded back so as to be hidden behind the base of the embolus, and S-shaped epigynal openings.

Within the subfamily, generic relationships are poorly understood, but it is clear that the genus *Metaphidippus* is polyphyletic. The genus should include at most a few species closely related to the neotropical genera *Messua* G. & E. Peckham, *Bagheera* G. & E. Peckham, and *Gastromicans* Mello-Leitão. *Gastromicans* is removed from synonymy with *Beata* G. & E. Peckham. The following new combinations are established for species in this group: *Bagheera prosper* (G. & E. Peckham), *Messua centralis* (G. & E. Peckham), *Messua dentiger* (F. P.-Cambridge), *Messua donalda* (Kraus), *Messua lata* (Chickering), *Messua laxa* (Chickering), *Messua limbata* (Banks), *Messua moma* (F. P.-Cambridge), *Messua octonotata* (F. P.-Cambridge), *Messua pura* (Bryant), *Messua tridentata* (F. P.-Cambridge), *Gastromicans albopilosa* (G. & E. Peckham), *Gastromicans hondurensis* (G. & E. Peckham), *Gastromicans levispina* (F. P.-Cambridge), *Gastromicans noxiosa* (Simon), and *Gastromicans vigens* (G. & E. Peckham). The combination *Messua desidiosa* G. & E. Peckham is revived. The proper placement of various groups currently assigned to *Metaphidippus* is discussed, and the *harfordii* group is transferred to the genus *Phanias* F. P.-Cambridge, which appears to be relatively distantly related to most other dendryphantines. The following new combinations are established: *Phanias albeolus* (Chamberlin & Ivie), *Phanias concoloratus* (Chamberlin & Gertsch), *Phanias dominatus* (Chamberlin & Ivie), *Phanias furcifer* (Gertsch), *Phanias furcillatus* (F. P.-Cambridge), *Phanias harfordii* (G. & E. Peckham), *Phanias monticola* (Banks), *Phanias neomexicanus* (Banks), and *Phanias watonus* (Chamberlin & Ivie). Also removed from *Metaphidippus* are the *mylothrus* and *castaneus* groups, for which the new genera Terralonus and *Ghelna* are described, thus yielding the new combinations *Terralonus californicus* (G. & E. Peckham), *Terralonus mylothrus* (Chamberlin), *Terralonus unicus* (Chamberlin & Gertsch), *Terralonus shaferi* (Gertsch & Riechert), *Terralonus versicolor* (G. & E. Peckham), *Terralonus vittatus* (Banks), *Terralonus fraternus* (Banks), *Ghelna castanea* (Hentz), *Ghelna barrowsi* (Kaston), *Ghelna sexmaculata* (Banks), and *Ghelna canadensis* (Banks). The new combination *Sassacus paiutus* (Gertsch) is established. The *vitis* group is retained in *Metaphidippus*. The limits of the genera *Dendryphantes* C. L. Koch and *Beata* G. & E. Peckham are also reconsidered. The combination *Dendryphantes nigromaculatus* Keyserling is revived and the following combinations established: *Beata hispida* (G. & E. Peckham), *Beata inconcinna* (G. & E. Peckham), *Beata maccunii* (G. & E. Peckham), and *Beata rustica* (G. & E. Peckham). *Dryphias* (G. & E. Peckham) is synonymized with *Beata*.

The largest group removed from *Metaphidippus* is placed in the genus *Pelegrina* Franganillo, 1930, whose species are, with some exceptions, distinguished from other dendryphantines by the presence of two terminal rami retrolateral to the embolus opening, an embolic hematodocha that bulges distally, wrinkles on the anterior margin of the male cheliceral fang, a distinct band of pale scales on the side of the face, and male courtship with the first legs held low and forward. The following species are moved into *Pelegrina*: *P. aeneola* (Curtis), *P. arizonensis* (G. & E. Peckham), *P. bicuspidata* (F. P.-Cambridge), *P. clemata* (Levi & Levi), *P. exigua* (Banks), *P. flaviceps* (Kaston), *P. flavipedes* (G. & E. Peckham), *P. furcata* (F. P.-Cambridge), *P. galathea* (Walckenaer), *P. helenae* (Banks), *P. insignis* (Banks), *P. montana* (Emerton), *P. ochracea* (F. P.-Cambridge), *P. pallidata* (F. P.-Cambridge), *P. peckhamorum* (Kaston), *P. pervaga* (G. & E. Peckham), *P. proterva* (Walckenaer), *P. proxima* (G. & E. Peckham), *P. tillandsiae* (Kaston), *P. variegata* (F. P.-Cambridge), and *P. verecunda* (Chamberlin & Gertsch). *Pelegrina proxima* is shown to be a senior synonym of *Pelegrina geniculata* Franganillo, the latter being the types species of *Pelegrina*. A neotype is designated for *Attus galathea* Walckenaer. Seventeen species are described as new: *P. balia*, *P. bunites*, *P. chaimona*, *P. chalceola*, *P. clavator*, *P. dithalea*, *P. edrilana*, *P.*

huachuca, *P. kastoni*, *P. morelos*, *P. neoleonis*, *P. orestes*, *P. sabinema*, *P. sandaracina*, *P. tristis*, *P. volcana*, and *P. yucatecana*. *Euophrys leucophaea* C. L. Koch, *Icius crassiventer* Keyserling, and *Metaphidippus digitatus* F. P.-Cambridge are newly synonymized with *P. galathea*; *Dendryphantes uteanus* Chamberlin & Gertsch with *P. aeneola*; and *Dendryphantes mimus* Chamberlin with *P. furcata*. *Euophrys concolor* Banks is removed from synonymy with *P. proterva* and considered a senior synonym of *Sittacus cursor* Barrows, yielding the new combination *Sitticus concolor*. Identification keys are presented for all *Pelegrina* males and for females from restricted geographical regions. All species are described and illustrated. Male/female associations were achieved for all species north of Mexico. Courtship behavior is described for 22 species of *Pelegrina*, karyotypes for 10 species, and habitat information for most species.

The genus *Pelegrina* may be closely related to the *Metaphidippus mannii* group, *Nagaina* and/or *Eris*. *Nagaina incunda* G. & E. Peckham is described and illustrated; *Dendryphantes vegetus* G. & E. Peckham, *Metaphidippus flavolineatus* F. P.-Cambridge, and *Metaphidippus expallidatus* F. P.-Cambridge are synonymized with *N. incunda*. The species of the *mannii* group (temporarily retained in *Metaphidippus*) that occur in the United States are also described and illustrated; two new combinations, *Metaphidippus chera* (Chamberlin) and *Metaphidippus carmenensis* (Chamberlin), are established; one species, *Metaphidippus emmiltus*, is described as new; *Dendryphantes versicolor* G. & E. Peckham is synonymized with *Metaphidippus mannii* (G. & E. Peckham), and *Metaphidippus franciscanus* Schenkel with *Metaphidippus diplacis* (Chamberlin).

INTRODUCTION

For about 50 years after the Peckham's (1909) revision of the jumping spider species north of México, taxonomic work on North American representatives of this large family consisted mostly of scattered species descriptions by Chamberlin, Gertsch, Ivie, and others. Some generic revisions consolidating and clarifying the previous work began appearing in the 1950s (Gertsch and Ivie, 1955; Barnes, 1955, 1958), but most genera remained untouched, including the three largest genera, *Habronattus*,* *Phidippus*, and *Metaphidippus*, which together include about half of the nearly 300 species of salticids occurring north of México (according to the count of Richman and Cutler, 1978). In the last three decades, increased interest in the family has resulted in revisions of *Habronattus* (Griswold, 1987), *Phidippus* (Edwards, in preparation), and other genera (Prószyński, 1968, 1971a, 1973a, 1980; Cutler, 1981a, 1987; Richman, 1981, 1989). However, except for works by Kaston (1973) on some eastern species and by Cutler and Jennings (1985) on the *arizonensis* group, *Metaphidippus* has remained unrevised, perhaps because its poorly defined limits have made the scope of any revision potentially troublesome. When I first began to revise *Metaphidippus*, I knew that I would have to restrict the revision to only some of the disparate groups placed there. The largest group placed in *Metaphidippus*, including the species most commonly collected in northern and eastern North America, was chosen for revision and is here moved to the genus *Pelegrina* Franganillo.

The jumping spiders placed in *Pelegrina* are medium-sized dendryphantines distributed throughout North America, with some species extending as far south as Panamá. The 38 species include the well-known *P. galathea*, *P. proterva*, *P. flavipedes*, *and P. aeneola*. Males of *Pelegrina* are generally brown with white stripes (Fig. 1), and most can be distinguished from other dendryphantines by the wide embolus with two rami retrolateral to the opening (Fig. 3). The spotted females (Fig. 2) have large thickened flaps over the epigynal openings (Fig. 4). Although the eastern species were well studied by Kaston (1973), most of the species occur in the western United States, México, and Central America, and they received their last comprehensive treatments by G. & E. Peckham (1909) and F. O. Pickard-Cambridge (1901). Many of the western species have been inadequately described and illustrated, often from only one sex, making identification almost impossible by anyone other than an araneologist familiar with the group. Many species in the southwest were undescribed, and for most species there is little published information on natural history. The present revision has as its main goal to make the species known, by describing and illustrating them, their courtship displays, and their habitats. Although much progress has been made in distinguishing species and matching males to females, many problems of geographical variation and uncertain male–female matching remain for future work, especially among Mexican *Pelegrina*.

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* Authors of scientific names are given in the index.

In addition to the *Pelegrina* species, *Nagaina incunda* and the U.S. species of the *Metaphidippus mannii* group are described because they could very well be confused with species of *Pelegrina* and because their taxonomy is in need of revision.

This work addresses the phylogeny of *Pelegrina* and the subfamily Dendryphantinae, but it has no pretensions of being a comprehensive or modern phylogenetic treatment. My phylogenetic goals are to propose some characters that might provide an outline of dendryphantine relationships, focusing on the question of the monophyly of *Pelegrina* and a few other groups formerly placed in *Metaphidippus*. I hope that this and the basic exploratory, species-level taxonomic work will provide the groundwork for future phylogenetic treatments.

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MATERIALS AND METHODS

Collections Examined. The taxonomic revision is based on specimens in the following collections. The abbreviation for the collection is followed by the name of the collection and the curator and others responsible for aiding in loaning the material, to whom many thanks are due:

AMNH	American Museum of Natural History, New York (N. Platnick, L. Sorkin)
BMNH	The Natural History Museum, London (P. Hillyard)
CAS	California Academy of Sciences, San Francisco (W. Pulawski, D. Ubick)
DU	Darrel Ubick personal collection
IESC	Instituto de Ecologia y Sistemática, Havana (Luis F. de Armas)
MCZ	Museum of Comparative Zoology, Cambridge (H. Levi)
MSUW	Midwestern State University, Wichita Falls, Texas (N. Horner)
TXAM	Texas A&M University, College Station, Texas (A. Dean)
UCB	University of California, Berkeley (E. Schlinger, C. Griswold)
UWBM	Burke Museum, University of Washington, Seattle (R. Crawford)
WPM	W. Maddison personal collection
ZMB	Zoologishes Museum Berlin (M. Moritz, S. Fischer)

Note that Canadian specimens are, in general, underrepresented in this revision because two major collections of Canadian spiders, the Canadian National Collection at the Biosystematics Research Centre, Ottawa, and the Royal Ontario Museum collection, were not examined due to time limitations.

Routine Examination and Illustrations. Specimens were examined in a glass dish with a bottom layer of half black, half white silicone rubber (bathtub caulking). The silicone rubber is superior to paraffin for most purposes, for it can hold even minuten pins firmly and later heal, and it offers the advantage over sand of allowing appendages to be pinned open. Palpi were mounted on Vaseline in an alcohol-filled depression slide with a coverslip and drawn at 100× and 200× under an Olympus BH-2 compound microscope using incident fiber-optics illumination and a camera lucida. Not only did the use of a compound microscope allow higher resolution, but also the axial light path prevented the drawing difficulties caused by the side-to-side shifting of the image that occurs when focusing on a stereo dissecting microscope. For the external (ventral) view, epigyna were examined using the same technique, without clearing. Epigyna were dissected off of the specimen to allow for the small working distance of the compound microscope. The Vaseline on which they were mounted was made opaque by mixing with chalk dust, in order to simulate the cream-colored muscles and glands that would underly the epigynum on an intact specimen. After examination of the specimen, Vaseline was removed by a xylene rinse. The oblique drawings of the male carapace and chelicerae were made mostly under the compound microscope, at 40×. Most drawings of the female abdomen were made under a Zeiss stereo dissecting microscope with a camera lucida. The drawings of the male face and female abdomen show the appearance in alcohol. Most drawings were done on coquille board with ink, a Conté drawing pencil, and white paint. Small labels with my initials (WPM) and the year drawn (e.g., 84) were placed in vials of specimens illustrated. Photographs of living specimens were made with a standard 55-mm lens reversed on extension tubes to yield approximately 2.5× magnification on Kodak Technical Pan or Kodachrome film, using illumination by flash. Measurements of carapace length, carapace width, and body length (Galiano, 1963; Wanless, 1978) were made from the dorsal view using an eyepiece reticle on a Leitz stereo dissecting microscope. Generally only about five specimens of each sex were measured, because little reliance on these measurements was made in this study. They are intended to give only a general idea as to the size and proportions of the species. The results are presented as follows: minimum (median) maximum. Thus, if five measurements for carapace length for the females of one species are 2.0, 2.1, 2.2, 2.3, and 2.3, these would be reported as follows: 2.0(2.2)2.3, n = 5.

Descriptions. A species description was originally written from a sample of five males and five females or more (if available). During subsequent identifications, the description was periodically checked to ensure that it covered the range of variation within the species. Two characters described that were less thoroughly sampled are the exact region of contact of the forehead band with the anterior median eyes, which was examined in only four to eight males, and the details of the internal epigynal ducts of the female, which in many species was examined in only one to three females.

Clearing. Clearing was used for detailed examination of the integument, especially to observe external and internal structures of the genitalia and mouthparts. The various body parts were cleared by placing them in warm trypsin solution for 1–2 days to digest internal tissues. When the trypsin-clearing procedure is successful, it reveals palp morphology to a level of detail not previously published (Figs. 3, 16–27). Trypsin was used instead of potassium or sodium hydroxide because it damages the cuticle very little and has shown no tendency to expand the palp except perhaps when hematodochae are tightly coiled as in *Ashtabula* and *Bagheera*. If the tissues of the specimen are well fixed and firm, then digestion will be very slow. Hence, for best results the specimen should be fresh-killed (not fixed) or "fixed" in a poor fixative with a low concentration of alcohol. Fresh-killed, dilute ethanol-triton fixed, 80% ethanol fixed, and Kahle's fixed specimens were all used. Specimens not fresh-killed were first rinsed in water for several hours before digestion. The body parts were separated to allow penetration of the trypsin. The trypsin solution was made from about 1 ml purified trypsin (Fisher #T-360) in 10 ml water, filtering after mixing. The trypsin was warmed under a light bulb during digestion. After digestion, the parts, especially dark, heavily sclerotized palps or epigyna, were bleached. They were first rinsed in water and then 80% ethanol, then moved to a solution of 1 part ethanol : 1 part 10% Aerosol for a day, and then for bleaching moved into a solution of 1 part 30% hydrogen peroxide : 1 part ethanol : 2 parts 10% Aerosol. Aerosol (Fisher) was added to the bleaching solution to inhibit the formation and buildup of bubbles, which otherwise can fill the body part and make it unusable. After about 1 day of bleaching, the body part was moved to 80% ethanol and then transferred to 95–100% ethanol. The body part was then mounted temporarily in clove oil or permanently in Euparal. For most specimens, the transferral to Euparal was accomplished by placing the body parts in Euparal thinned with either ethanol or Euparal Essence and letting the ethanol or essence evaporate off, thus gradually taking the specimen through a series of stronger Euparal solutions. This was most easily done directly on the microscope slide, which was then let to dry partially in a dust-free area. Drying thickened the Euparal, allowing final positioning of the parts before adding the coverslip. After the coverslip is added, the body parts, especially the palpus, may move. Thus, the palp was placed near the edge of the coverslip to allow repositioning using a microneedle slipped under the coverslip.

Expansion of Palps. Palps were best expanded permanently by boiling the specimen alive and then fixing it in dilute Kahle's fluid to harden it in an expanded position followed by gradual dehydraton to 80% alcohol. This technique is much like that described by Sadana (1971). Palps so prepared are resistant to contraction and can be critical-point-dried successfully (Figs. 7, 9). A few palpi that were already preserved in alcohol were expanded in a few minutes by placing them in a hot mixture of 15% hydrogen peroxide, 40% water, and 45% ethanol.

Chromosomes. Chromosomes were examined using the Feulgen technique as described by Maddison (1982). The results are given under the description of each species examined.

Courtship. Courtship observations were obtained for *Pelegrina* species and numerous other dendryphantines. Specimens were examined within a few days after collecting. A male and a female were placed on a cotton beating sheet, usually not in full sunlight, and manipulated until the male faced the female and began display. Behavior of the male was observed by eye, and notes and still photographs were taken. Female behavior was not recorded. For most species, no filming or videotaping was done. As salticid behavior can be fast, it is difficult to take notes accurately, and there are likely errors in observation, especially of subtle differences in timing and positions. Still, consistency of observations and videotape confirmation of my own previously taken notes for *Pelegrina dithalea, Metaphidippus mannii, Metaphidippus chera,* and *Phanias watonus* all indicate that the descriptions should be generally accurate. There are a number of observations, such as the alternate palp waving in the *Pelegrina flavipedes* group and the triangular crouch pose of *Pelegrina aeneola,* that have been repeated a number of times and in which I have strong confidence. In the descriptions of the displays, the sample sizes for the observations are indicated by listing the number of observations for each feature of the display. For instance, in the description of the courtship of *P. galathea,* the following sentence occurs: "First legs flicker (n = 12, 6♂) on each series (n = 4, 2♂) up and down (n = 4, 2♂) and alternately back and forth at tips (n = 1), vigorously (ca. 5 c/s) (n = 1) but at low amplitude (n = 5, 3♂)." The parenthetical comments indicate the number of observations (n) and the number of males in which the feature was noted. The number of observations was counted as follows: a male was observed doing a bout of courtship display; any features of position or motion were considered to have thus been observed once during this bout. If the male stopped displaying because the female left or rejected him, and if he began again later (perhaps after I had moved them back together), then the next display was counted as a separate observation. While the more obvious features of the display may have been observed many times (for instance, that the legs were flickered was observed 12 times in six males in the preceding example), some of the more subtle details of the display were not noticed in most displays and, thus, would have been observed only a few times (for instance, that the legs flickered "alternately back and forth at tips" was observed only once). Where there is variation, the description lists each of the alternatives with an indication of sample sizes. For instance, if the legs were usually flickered at low amplitude, but occasionally at high amplitude or not at all, the description might read like this: "On each series legs flickered (n = 9, 1♂) noticeably (n = 1) or with fairly low amplitude (n = 7, 3♂) or perhaps not at all (n = 3, 1♂)." Sample sizes are in general small. It was felt that it is presently more important to obtain a broad survey, including many species, than a deep analysis of a few species. Explanations of terms used to describe courtship are given in the section Explanation of Morphological and Behavioral Terms and in the description of behavioral characters (item 7) supporting the monophyly of *Pelegrina.*

Phylogenetic Analysis. Though this work is primarily concerned with the genus *Pelegrina,* an attempt was made to outline the broader structure of the family and the relationships of dendryphantines, partly for their own sake and partly to set the context for the genus *Pelegrina*. The general discussion of phylogeny within the family is presented separately (Maddison, 1988, unpublished manuscript). My phylogenetic proposals are presented in a narrative discussion of groups and characters; no numerical phylogenetic analysis was done. Table 2 shows the distribution of some of the more important characters, but it will be noted that some of these do not perfectly support the groups proposed. Problems with some of the characters are noted in the phylogenetic discussion. Furthermore, the presumption of ancestral state for a given character is usually not accompanied by rigorous outgroup analysis (e.g., Maddison et al., 1984). We are still making only preliminary sketches of the phylogenetic structure of this large and poorly known family, and it would not be productive to delay phylogenetic hypotheses until they can be rigorously defended. The suggestions made should have at least a glimmer of truth and will, I hope, stimulate future work.

Species Distinctions. Populations were considered distinct species if several consistent and discrete morphological differences could be found among them, but when there were few differences, apparent intergradation, or little material, the decision as to whether one or more species are present was sometimes difficult. In several cases, only a single species was recognized despite geographical variation, because the geographical variation was too confusing at present (*furcata-mimus*), or because the differences were slight and possibly not consistent (*aeneola/uteanus*, northern and Floridian *tillandsiae*, northern and southern *carmenensis*, *mannii/versicolor*). In other cases, allopatric populations that are similar but that differ consistently in a number of features were recognized as distinct (*sabinema/pervaga*, *bicuspidata/volcana*, *neoleonis/tristis*, *proxima/galathea/dithalea*, *chera/tricolor/diplacis*), though in each of these cases the decision was difficult. *Pelegrina flavipedes*, *flaviceps*, and *exigua* were maintained distinct despite apparent hybridization because they differ in numerous features. The two sympatric forms of *exigua* were left under one specific name until they can be better studied.

Male/Female Matching. Care had to be taken in proposing which males and females belonged together in the same species, as in other spiders (Levi, 1985). The problem was especially bad in *Pelegrina* species from the southwestern United States, México, and Central America, where collecting has been limited. Despite the strong sexual dimorphism, similarity in body form and markings could often be used as evidence. Other criteria used were expected correlations in genitalia (e.g., wide, robust embolus with strong epigynal flaps), co-collecting in same geographical region, locality, or microhabitat, and similarity of the male and female each to those of another well-matched species. Comments regarding evidence used to match males and females are given in those species descriptions where it seems needed. Among the less certain matchings are those for *Pelegrina sandaracina*, *pallidata*, *chaimona*, *huachuca*, and *morelos*.

EXPLANATION OF MORPHOLOGICAL AND BEHAVIORAL TERMS

Markings in General. Color patterns are generated by integument coloring and by covering of setae, though pale setae usually overlie pale integument and dark overlie dark. The terms *hair* and *scale* are used to refer to a thin, more or less cylindrical seta and a broad, flattened seta, respectively (cf. Hill, 1979).

Markings of the Carapace. Male dendryphantines are commonly dark brown with bands of white to yellow scales, usually including a major longitudinal band on either side of the carapace and abdomen. The following names are used to refer to the bands of pale scales on the carapace (Fig. 1):

side bands: Longitudinal bands on either side of carapace, beginning beside the anterior lateral eyes (ALEs) and proceeding just beneath the small eyes and posterior eyes and beyond, onto the thorax.

cheek band: Oblique band on the side of the face, starting beneath the ALEs and proceeding down and posteriorly to the carapace margin, in *Pelegrina* and the *mannii* group.

forehead band: A V-shaped marking on the dorsal cephalic area just behind the anterior median eyes (AMEs).

marginal band: On the lower margin of the sides of the carapace, often extended from the cheek band in *Pelegrina*. Females of most species show none of these bands distinctly; the carapace is instead often covered more or less uniformly with pale scales including a dense white covering on the clypeus.

Setae Surrounding Anterior Median Eyes. These are of various colors, from white to black. In the descriptions of *Pelegrina* males, the colors of setae around the circumference of the *left* anterior median eye (AME) are indicated using a notation derived from hours on a clock's face. Usually, the colors on only the dorsal part of the AMEs are described, for those ventrally are more variable. Thus, "white forehead band contacts the AME dorsally 10:30–12:30" means that as one looks from the front at the left AME there are white setae from 10:30 o'clock to 12:30 o'clock that are continuous with the forehead band, and dark setae on either side of this.

Markings of the Legs. The legs are yellow to dark brown, but there are often annulate markings (Fig. 1), especially in males, so that each leg has pale portions covered with white scales alternating with darker portions lacking white.

Markings of the Abdomen. The abdomen is usually brown above in males, ringed by white *side bands* (Fig. 1). The dorsum of the abdomen often shows traces of the *paired pale spots* seen in females (Fig. 2). These pale spots are central and paired: the first pair just anterior to the muscle attachment of the second dorsoventral muscle (number 86viii + ix of Whitehead and Rempel, 1959), the second pair anterior to the attachments of the third dorsoventral muscle, and the third, fourth, fifth, and sixth pairs of spots behind this. The fifth and sixth pairs are very small. Often the fourth through sixth pairs are each connected medially and thus form small chevrons. Between these pale spots may be spots of dark brown, sometimes very dark (e.g., Fig. 353).

Male Palpus (Figs. 3, 6–9). The descriptions generally assume that the left palp is being viewed from the ventral. The adjectives basal and apical when unqualified refer to the appearance in a contracted palp (i.e., basal = toward the tibia and apical = toward the tip of the cymbium). In contrast, "anatomically basal" and "apical" refer to the cymbium–embolus axis of connections of the palp's bulb (ie., anatomically basal = toward the basal hematodocha and anatomically distal = toward the tip of the embolus).

In the subfamily Dendryphantinae, the shoe-shaped *cymbium* holds a bulb consisting of (from anatomically basal to apical) a fully expandable basal hematadocha, a small subtegulum, a much reduced median hematodocha, the large tegulum, a fully expandable distal (embolic) hematodocha, and the embolus. The *basal hematodocha* expands so as to give a clockwise rotation to the subtegulum and tegulum in ventral view of the left palp, as in other salticids. This has been observed by artificial expansion on many dendryphantines and during copulation of *Dendryphantes nigromaculatus.* The *subtegulum* is small and contains little more than the basal portion of the sperm duct reservoir (Figs. 3, 8).

From the subtegulum, the *sperm duct* loops up, down, and around the *tegulum* (Fig. 3) in a clockwise direction to the embolus. The distal retrolateral portion of the tegulum, where the sperm duct enters the tegulum from the subtegulum, is generally extended distally and contains a loop of the sperm duct pressed against its wall. This portion I call the *shoulder* of the tegulum (Fig. 3). Just proximal to the embolus and shoulder is a fold extending across the surface of the tegulum, the *tegular ledge* (Figs. 3, 6, 7), which serves as a pocket to hold the proximal part of the embolic base. Wanless (1984) suggested that the tegular ledge (his M3) is absent from salticids other than spartaeines, in which he described it. However, the fold that I am here calling the tegular ledge may be homologous with his M3, for it appears as an extension of the embolic hematodocha cutting across the face of the tegulum and occurs in many groups of salticids. The tegulum is filled with *tegular glands,* which empty into the sperm duct via a series of pores in the sperm duct (see Osterloh, 1922; Bhatnagar and Rempel, 1962). As in other spiders, these pores are aligned into a band (Schult, 1980), which, when narrow, appears as if it were a seam along the length of the sperm duct. Along the narrower part of the sperm duct toward the embolus, the glands are connected to the sperm duct via long ducts (Fig. 3; also known from other spiders; Osterloh, 1922: figs. 20, 26). These pores, ducts, and glands have been largely ignored in systematics but appear to be a potential source of good systematic characters (for instance, in some salticids the pores are arranged in a broad ribbon, whereas in others the band is very narrow, and in *Sitticus* the pores are arranged into prominent craters).

The *embolic hematodocha* arises on the back side of the tegulum (Fig. 8), prolateral to the subtegulum. Its wrinkles sweep apically up toward the embolus. The exact arrangement of the folds of the hematodocha is probably of systematic value but is very difficult to untangle, for especially near the base of the embolus the folds are twisted and confusing even in a well-cleared palpus. During expansion, the embolic hematodocha expands fully to move the embolus counterclockwise (i.e., prolaterally) and back (i.e., toward the cymbium), as indicated by artificial expansions (Figs. 7, 9). The counterclockwise movement of the embolus itself probably explains why the counterclockwise-coiled embolus can still engage the epigynal opening despite the clockwise movement of the tegulum (in salticids with the embolus fixed to the tegulum, the embolus has a clockwise curve, which thus coincides with the clockwise thrust of the tegulum). The *embolus* of dendryphantines usually consists of a basal portion, which is transversely directed, and an apical portion, which is usually thin and erect and has the opening of the sperm duct at its tip (Figs. 40–47; also Figs. 64b, d). The *embolic base* consists of a more or less sclerotized portion of the embolic hematodocha that is exposed to the ventral surface and that rests betwee the tegular ledge and the embolus (Figs. 3, 6, 7). Its wrinkles suggest that it should be considered part of the hematodocha. As noted, the embolus is coiled counterclockwise, a feature much more readily apparent in the euophryines and other subfamilies than it is in the dendryphantines. In dendryphantines, the spiral is hidden and best seen in expansions or dissections (e.g., Fig. 35). The dendryphantine embolus arises prolaterally and moves across toward the retrolateral side (the transverse basal portion of the embolus) and then folds back toward the prolateral and abruptly rises as the erect apical portion (Figs. 20–23). In many genera, the erect apical portion is fused against the transverse portion so that there is no open, freely coiling spiral. A suture on the back side of the embolus (the *embolic suture*), between the transverse portion and the erect portion, is often present and indicates where the folded-back spiral has not completely fused (Figs. 3, 8, 20–23, 31–35). In cleared palpi, a slight bend in the sperm duct can be seen at this point. The coiling of the embolus and the embolic suture suggesting it are clearly visible in *Dendryphantes, Eris, Pelegrina, Phidippus, Tutelina, Phanias,* and many other genera. In *Metaphidippus chera,* the coiling is easily seen (Fig. 35); in *Pelegrina proterva,* the only trace is the small suture (Fig. 34); in *Pelegrina flavipedes,* the suture is sometimes visible and sometimes not. No trace of the suture or past coiling can be found in *Terralonus* cf. *unicus* and *Poultonella alboimmaculata,* but *Terralonus mylothrus* and *Tutelina elegans,* which are, respectively, their close relatives, show them well. The loss of a trace of coiling may have evolved several times in the dendryphantines. In some genera such as *Zygoballus, Hentzia* and *Mabellina,* the coil is not so compact and, instead, is more open (e.g., Figs. 24–27, 37, 38, 50, 51, 58–63, 64c, f). Figure 64 summarizes some of the coiling patterns seen in dendryphantines. The erect portion of the embolus is sometimes a simple spike with the opening terminal, but in many dendryphantines there are prolongations that will be referred to as *rami,* and often small denticles occur on the surface of the embolus. In *Pelegrina,* in particular, there are two rami retrolateral to the opening of the sperm duct, the prolateral ramus very near the opening and the retrolateral ramus some distance away (Fig. 3).

Epigynum. In most dendryphantines, the openings are well separated and S-shaped (Figs. 65–70), with entry toward the lateral in the anterior half and toward the medial in the posterior half (Fig. 5). The lateral rim of the opening is often thickened to yield a more or less convex teardrop-shaped area, which will be called the *epigynal flap* (Fig. 4). The inner margins of the left and right flaps may be *parallel* to each other (e.g., Figs. 262, 274, 322) or be *divergent* from anterior to posterior (e.g., Figs. 346, 352, 398) or be *convergent* (e.g., Figs. 280, 297, 332, 363). In some *Pelegrina,* the flaps converge to such an extent that their posterior halves are rotated 90° and become transverse (e.g., *P. kastoni,* Fig. 317). Even more extreme rotations are seen in *P. arizonensis* (180°, Fig. 424) and *P. helenae* (270°, Fig. 430). The surface of the epigynum between and behind the openings varies in topography among the species of *Pelegrina* (Figs. 236–255). In some, the entire surface behind the openings is raised into a mound (e.g., *P. clemata,* Fig. 246); in others, it is much more concave (e.g., *P. furcata,* Figs. 249, 250). At the posterior margin of the epigynum is the *notch,* or guide (Figs. 4, 5), into which fits the male tibial apophysis, although in some dendryphantine groups (*Poultonella, Hentzia*) the guide has moved anteriorly as in pellenines (*Pellenes, Habronattus*) and *Bianor.*

The different parts of the copulatory ducts of *Pelegrina* species are named as follows (Fig. 5). From the anterior half of the openings, the ducts proceed first laterally and posteriorly (the *first curve*), then medially (the *second curve*), and then posteriorly (the *third curve*), and then twist a number of times and proceed dorsally to the fertilization ducts. The inner surface of the duct is relatively smooth in the first and second curves, smooth or rough in the third curve depending on the species, and rough with projections in the twisted area posteriorly. The *flower-shaped openings* of the accessory glands occur on the second curve, usually near the junction with the first curve (Fig. 5). The pathway from the copulatory opening through the copulatory ducts toward the fetilization ducts is almost straight, lacking the separate spermathecal reservoir seen in, for instance, some euophryines.

Courtship. Some introduction to the format of descriptions of courtship has already been given under the Materials and Methods section. Males, especially early in display, often walk not straight toward the female but instead *sidle* so that they approach obliquely or not at all. The sidling may be first to the left and then to the right, and so on, to form a zigzag dance (Jackson, 1978). The male usually walks sporadically, taking a series of steps then pausing, another series of steps then pausing, and so on. Because the male's pose and motions of the first legs, palp, and abdomen often differ depending on whether he is walking or paused, a distinction is made between the walking phase, which is called the *series* (of steps), and the *pauses*. While the male is walking, the first legs are generally raised, spread, and/or extended forward. The first legs may be *waved* or *flickered* up and down or forward and backward, one or repeatedly. The distinction between a wave and a flicker is not precise; in general, "wave" is used when the motion is of low speed or frequency, "flicker" for high-frequency repeated motions. The abdomen may be *twitched* (Jackson, 1978) down then up, which in many species produces a sound that may function in courtship (Maddison and Stratton, 1988). Explanations of "crouch" and "raisedspread" stages of courtship are given in the discussion of monophyly (item 7) in the description of the genus *Pelegrina*.

THE SUBFAMILY DENDRYPHANTINAE

Pelegrina and *Metaphidippus* are dendryphantines, which are salticids. Maddison (1988) reviewed the phylogeny of the family Salticidae. The majority of salticid species are considered to form a monophyletic group, called the Salticine division (Maddison, 1988), which are distinguished from the remaining groups (Lyssomaninae, Spartaeinae, and the *Cocalodes* group) by eye structure (Wanless, 1984; Eakin and Brandenburger, 1971; Blest, 1983; Blest and Sigmund, 1984), absence of a tarsal claw on the female palp, medial displacement of the gnathocoxal glands (Figs. 14, 15), asymmetrical tarsal claws, a mound of slit sense organs with an associated seta on the medial edge of the chelicera (Figs. 12, 13), and a small intercheliceral sclerite (Figs. 12, 13), each of which may be considered derived within the family. Within the Salticine division, there are some prominent subfamilies that have the embolus fixed immovably to the tegulum, including the Heliophaninae (delimited by an apparent stridulatory apparatus and a bump on the tegulum just clockwise [left palp] of the embolus; Maddison, 1987), the Plexippinae (including *Plexippus, Hyllus, Evarcha, Thyene, Telamonia, Harmochirus*, and part of *Bianor*, delimited by a modified serrula on the male endite and a bump on the tegulum just counterclockwise [left palp] of the embolus), and many other familiar groups such as *Pellenes, Salticus, Sitticus, Phiale, Myrmarachne, Amycus,* and their respective relatives. However, the Euophryinae, Dendryphantinae, and several smaller groups are united by an embolus that is free to move, being separated from the tegulum by a fully expandable hematodocha (Figs. 29–31). In these groups, the embolus is also coiled counterclockwise (left palp). The subfamily Dendryphantinae itself is delimited by the derived conditions of a carina on the underside of the male chelicera, by the coil of the embolus folded back so as to be hidden behind the base of the embolus, and by S-shaped epigynal openings.

The Dendryphantinae is a subfamily of several hundred species, most of these in the New World. Males are usually striped, with longitudinal bands of pale scales on either side of the carapace and abdomen, while females usually have paired spots on the abdomen. The chelicerae of males are often enlarged or elongate as is the first pair of legs. The posterior eyes are smaller than in most euophryines.

Table 1 lists the generic names (including those now considered synonyms) that I refer at least tentatively to the subfamily. Some of these genera are included for the first time. Some genera are included with hesitation, either because they are obscure and their type species were not examined (e.g., *Anamosa, Homalattus*) or because they exhibited none of the supposed dendryphantine synapomorphies listed later but have the general body form and markings much like those of other dendryphantines (e.g., *Mabellina*). Other genera are excluded with hesitation—for instance, those genera related to *Ballus* (*Colaxes, Marengo, Padilla, Pachyballus,* and perhaps *Admestina*) and to *Synageles* (*Consingis, Descanso, Peckhamia,* and

TABLE 1. GENERIC NAMES OF JUMPING SPIDERS TENTATIVELY REFERRED TO THE SUBFAMILY DENDRYPHANTINAE. SYNONYMIES ARE NOT INDICATED.

Admirala G. & E. Peckham, 1901
Agassa Simon, 1901
Amerotritte Mello-Leitão, 1944
Anamosa G. & E. Peckham, 1895
Anicius Chamberlin, 1925
Anoka G. & E. Peckham, 1893
Ashtabula G. & E. Peckham, 1894
Avitus G. & E. Peckham, 1896
Bagheera G. & E. Peckham, 1896
Beata G. & E. Peckham, 1895
Bellota G. & E. Peckham, 1892
Bryantella Chickering, 1946
Cerionesta Simon, 1901 (n. nov. for *Cydonia* G & E Peckham, 1893, preoccupied)
Chirothecia Taczanowski, 1878
Dendryphantes C. L. Koch, 1837
Donaldius Chickering, 1946
Dryphias Simon, 1901
Eris C. L. Koch, 1846
Gastromicans Mello-Leitão, 1917
Ghelna new genus
Hentzia Marx, 1883
Homalattoides F. P.-Cambridge, 1901
Homalattus White, 1841
Lurio Simon, 1901
Mabellina Chickering, 1946
Maeviobeata di Caporiacco, 1947
Megatimus Thorell, 1891
Messua G. & E. Peckham, 1896
Metaphidippus F. P.-Cambridge, 1901
Nagaina G. & E. Peckham, 1896
Osericta Simon, 1901
Paradamoetas G. & E. Peckham, 1885
Parahentzia Bryant
Paraphidippus F. P.-Cambridge, 1901
Parnaenus G. & E. Peckham, 1896
Partona Simon, 1902
Pelegrina Franganillo, 1930
Phanias F. P.-Cambridge, 1901
Phidippus C. L. Koch, 1846
Poultonella G. & E. Peckham, 1909
Ramboia Mello-Leitão, 1944
Rhene Thorell, 1869 (n. nov for *Rhanis* C. L. Koch, 1848, preocc.)
Rhetenor Simon, 1902
Rudra G. & E. Peckham, 1885
Sassacus G. & E. Peckham, 1895
Sebastira Simon, 1901
Selimus G. & E. Peckham, 1901
Semora G. & E. Peckham, 1892
Tacuna G. & E. Peckham, 1901
Terralonus new genus
Thammaca Simon, 1902
Tulpius G. & E. Peckham, 1896
Tutelina Simon, 1901
Uluella Chickering, 1946
Wala Keyserling, 1884
Zeuxippus Thorell, 1891
Zygoballus G. & E. Peckham, 1885

perhaps *Cheliferoides* and *Leptorchestes*) may very well be derived dendryphantines (see Maddison, 1988).

Simon (1901, 1903) placed many of these dendryphantine genera in his group Dendryphanteae or Rheneae, though a number of them were scattered among other groups: *Beata* in the Simaetheae, *Bellota* in the Synageleae, *Nagaina* in the Bellieneae, *Rudra* in the Rudreae, *Tutelina* in the Chrysilleae, and *Zygoballus* in the Zygoballeae. G. & E. Peckham (1901b) included in their *Phidippus* group of genera *Phidippus, Paraenus, Dendryphantes, Selimus,* and *Admirala,* here considered dendryphantines, but as well many other genera now considered to belong to the Euophryinae and other subfamilies. Prószyński (1976: 15, 148–150) listed the genera *Cheliferoides, Dendryphantes, Eris, Metaphidippus, Paradamoetas, Phidippus, Rhetenor, Sassacus, Thiodina,* and *Wala,* in the subfamily Dendryphantinae; all except *Cheliferoides* and *Thiodina* are here considered dendryphantines.

Specifying distinct apomorphies to justify my concept of the subfamily is difficult, for no characters both universal throughout and unique to the group are known; homoplasy must therefore be invoked if the subfamily is to be accepted as proposed. Three characters derived within the family are proposed as synapomorphies of the subfamily:

1. Carina on underside of the male chelicerae (Table 2, character 1). On the ventrolateral edge of the basal segment of the chelicera there is a fold or carina (Fig. 10). This carina occurs in almost

TABLE 2. CHARACTERS USED IN RECONSTRUCTING DENDRYPHANTINE PHYLOGENY.

	1. Carina	2. Spiral	3. Epig. Op.	4. Tib Ap	5. Teg ledge	6 Fusules	7 Hem Bulge	8. F Wrinkles	9 Courtship	10. T. Ridge
Pelegrina proterva (Walckenaer)	present	hidden	sinuate	tapered	40°	?	present	present	crouch	present
P. galathea (Walckenaer)	present	hidden	sinuate	tapered	40°	absent	present	present	crouch	present
P. peckhamorum (Kaston)	present	hidden	sinuate	tapered	50°	absent	present	present	crouch	present
P. flavipedes (Pkm.)	present	hidden	sinuate	tapered	40°	?	present	present	crouch	weak
P. clemata (Levi & Levi)	present	hidden	sinuate	tapered	40°	absent	present	present	crouch	present
P. montana (Emerton)	present	hidden	sinuate	tapered	50°	absent	present	present	crouch	present
P. insignis (Banks)	present	hidden	sinuate	tapered	40°	?	present	present	crouch	present
P. aeneola (Curtis)	present	hidden	sinuate	tapered	40°	?	present	present	crouch	present
P. furcata (F. Cambridge)	present	?	sinuate	tapered	40°	absent	present	present	rs	present
P. arizonensis (Pkm.)	present	?	sinuate	tapered	70°	absent	present	present	rs	present
P. tillandsiae (Kaston)	?	hidden	sinuate	?	50°	?	present	?	?	present
P. bunites new species	present	hidden	sinuate	tapered	50°	?	present	present	crouch	weak, present
P. orestes new species	present	hidden	sinuate	tapered	40°	?	present	absent	crouch	absent
Metaphidippus mannii (Pkm.)	present	hidden	sinuate	tapered	50°	?	absent	absent	crouch	present
M. chera (Chamberlin)	present	hidden	sinuate	tapered	40°	absent	absent	absent	crouch	absent
Anicius spp.	present	hidden	not	tapered	80°, 90°	absent	absent	absent	rf	absent
Ashtabula dentata F. Cambridge	present	?	not	er. blade	50°	?	?	absent	?	?
Bagheera prosper (Pkm.)	absent	?	not	er. blade	90°	absent	?	absent	rf	absent
Beata hispida (Pkm.)	present	hidden	sinuate	tapered	30°	absent	absent	absent	rs	present
"*Beata*" *octopunctata* (Pkm.)	absent	?	not	tapered	70°	absent	absent	present	?	absent
"*Beata*" *wickhami* (Pkm.)	absent	?	not	tapered	40°	present	?	absent	rf	absent
Bellota wheeleri Pkm.	present	hidden	sinuate	tapered	50°	absent	absent	absent	ls	weak
Dendryphantes rudis (Sundevall)	present	hidden	sinuate	tapered	40°	absent	absent	absent	?	absent
D. nigromaculatus (Keyserling)	present	hidden	sinuate	?	40°	?	absent	absent	rf	?
"*D.*" *zygoballoides* Chamberlin	present	hidden	sinuate	tapered	70	absent	absent	absent	?	absent
Eris militaris (Hentz)	present	hidden	not	tapered	40°	absent	absent	present	crouch	weak
E. floridana (Banks)	?	hidden	sinuate	?	40°	?	absent	?	?	?
E. aurantia (Lucas)	present	hidden	sinuate	tapered	50°	absent	absent	absent	ls, rf	weak
Gastromicans levispina (F. Cambridge)	present	?	not	er. blade	90°	absent	?	absent	?	absent
Ghelna sexmaculata (Banks)	present	?	?	?	60°	absent	?	?	?	?
Ghelna barrowsi Kaston	present	?	?	tapered	?	absent	?	?	?	?
"*Eris*" *nidicolens* (Walckenaer)	absent	open	not	tapered	80°	present	absent	absent	?	absent
Hentzia palmarum (Hentz)	absent	hidden	not	tapered	50°	present	?	absent	ls	?
Messua limbata (Banks)	absent	?	not	?	90°	absent	?	absent	rs, rf	absent
"*Metaphidippus*" *vitis* (Cockerell)	present	open	not	tapered	?	absent	?	absent	rf	weak

TABLE 2. CONTINUED.

	1. Carina	2. Spiral	3. Epig. Op.	4. Tib. Ap.	5. Teg. ledge	6. Fusules	7. Hem. Bulge	8 F. Wrinkles	9 Courtship	10. T. Ridge
"*M.*" cf. *pluripuncatus* Mello-Leitão	present	open	sinuate	tapered	?	?	?	absent	?	absent
Paradamoetas sp.	absent	open	not	?	?	absent	?	absent	rs	?
"*Paraphidippus*" *validus* Chickering	absent	?	not	er. blade	?	absent	?	?	?	?
Parnaenus recurvus Chickering	present	?	not	?	50°	absent	?	absent	?	absent
Phanias harfordii (Pkm.)	absent	hidden	sinuate	tapered	90°	present	absent	present	rf	absent
P. watonus (Chamberlin & Ivie)	absent	?	?	tapered	90°	present	absent	present	rf	absent
P. albeolus (Chamberlin & Ivie)	absent	hidden	sinuate	?	90°	present	absent	present	rf	?
P. neomexicanus (Banks)	present	?	sinuate	tapered	80°	present	absent	?	crouch	absent
P. monticola (Banks)	present	?	sinuate	tapered	60°	present	absent	?	?	absent
Phanias sp.	present	?	sinuate	?	90°	present	?	present	rf	?
Phidippus audax (Hentz)	present	hidden	sinuate	?	50°	absent	absent	absent	rs	?
P. purpuratus Keyserling	present	hidden	sinuate	tapered	40°	absent	absent	absent	rs	absent
P. whitmani Pkm.	?	hidden	sinuate	tapered	40°	absent	absent	absent	?	absent
P. clarus Keyserling	present	hidden	?	?	50°	absent	?	absent	?	?
Poultonella alboimmaculata (Pkm.)	absent	?	?	er. blade	?	absent	absent	absent	?	absent
"*Pseudicius*" *siticulosus* Pkm.	present	hidden	sinuate	tapered	50°	absent	absent	absent	rf	absent
Rhene cf. *flavigera* (C. L. Koch)	absent	hidden	sinuate	tapered	70°	present	absent	absent	?	?
Sassacus papenhoei Pkm.	present	hidden	sinuate	tapered	40°	absent	absent	absent	rf	absent
Selimus sp.	present	open	not	tapered	?	absent	?	present	?	absent
Terralonus myolothrus (Chn.)	present	hidden	sinuate	tapered	40°	absent	absent	absent	?	absent
Tutelina elegans (Hentz)	absent	hidden	?	tapered	40°	absent	absent	absent	crouch	absent
Tulpius hilarus Pkm.	present	hidden	?	tapered	50°	absent	absent	absent	ls	present
Zygoballus rufipes Pkm.	present	hidden	not	?	?	absent	?	absent	rs	?
Z. sexpunctatus (Hentz)	present	?	not	tapered	70°	absent	absent	absent	rs	absent
Zygoballus incertus Chickering	absent	open	not	?	80°	absent	absent	absent	rs	?

[a] Characters: 1, ventrolateral carina on male chelicera; 2, spiral of embolus hidden or open; 3, shape of epigynal openings; 4, tibial apophysis an erect blade or tapered; 5, angle of tegular ledge from the transverse; 6, epiandrous gland fusules; 7, embolic hematodocha bulges to shoulder of embolus; 8, wrinkles on male fang; 9, courtship display pose (ls = lowspread, rf = raisedforward, rs = raisedspread, crouch = crouch display); 10, ridge under tibial apophysis. Authors' abbreviations Pkm. = G. & E. Peckham.

Quotation marks around generic names indicate that I believe the current generic placement of the species is incorrect, but I will not here attempt to move the species. "*Eris*" *nidicolens* is almost certainly not an *Eris* but, rather, may be more closely related to *Phanias*. *Zygoballus incertus* should probably be placed in *Ramboia* (Bauab-Vianna and Soares, 1982). "*Pseudicius*" *siticulosus* is clearly not a *Pseudicius* (subfamily Heliophaninae; see Maddison, 1987), but whether it can fall into an existing dendryphantine genus is unclear; Edwards (1980) has moved *Icius annectans* (probably = "*P.*" *siticulosus*) to *Metaphidippus*. "*Paraphidippus*" *validus* belongs in the genus *Lurio*. As noted in the text, "*Beata*" *wickhami* and "*Beata*" *octopunctata* do not belong in *Beata*, the former with genitalia closely resembling *Hentzia* and the latter of uncertain affinity. "*D.*" *zygoballoides* is not a *Dendryphantes* but its proper placement is unclear.

all genera considered dendryphantines. It is absent in some groups in which the chelicerae are much elongate (*Messua, Hentzia, Rudra, Paradamoetas*), though this may be related to the elongation, as *Hentzia mitrata* (with short chelicerae) does have the carina. More troublesome are those dendryphantine groups (some *Phanias, Tutelina, "Eris" nidicolens, "Beata" octopunctata*) in which the chelicerae are not elongate and yet the carina is lacking. In at least one of these, *Phanias,* there are some species with the carina, and its absence in others is presumably a secondary loss. The carina is lacking in all other salticids I have seen, except for *Simaetha paetula* (see Prósyński, 1984: 132) and *Simaetha tenuior,* in which a similar carina is present. These species have a *Sitticus*-like palpus, with a round tegulum and immovable embolus, and appear to be distantly related to dendryphantines.

2. Coil of embolus compressed, so that the embolus folds back sharply on itself and superficially appears not to be coiled (Figs. 20–25, 31–35, 37–39, 64b–d, g; Table 2, character 2). Typically, the embolus arises prolaterally and moves across toward the retrolateral side (the transverse basal portion of the embolus) and then folds back toward the prolateral and abruptly rises as the erect apical portion. A suture on the back side of the embolus, between the transverse portion and the erect portion, is often present and indicates where the folded-back spiral has not completely fused. The coils of the embolus are not folded but rather open and exposed (Fig. 19), in the other groups, such as the euophryines, that have a counterclockwise-coiled embolus. Two main problems with the use of this character are posed by various dendryphantines: in some, the embolus appears not even coiled, and in others the embolus appears coiled but the coils are exposed (Fig. 64 summarizes some of the variation seen among the dendryphantines). Despite the first problem, coiling is considered primitive for the subfamily (see earlier discussion under the section Explanation of Morphological and Behavioral Terms). More troublesome is the second problem: the occurrence of dendryphantine groups such as *Paradamoetas,* the South American *"Sassacus," Mabellina, Dendryphantes tropicus,* and *Bryantella* in which the coils of the embolus are exposed (Figs. 26, 27, 58–63, 64e, f). However, three lines of evidence suggest that the exposure of the coils is not homologous to that of the euophryines and, instead, is secondarily derived from the hidden condition. First, the exposed spiral of Dendryphantines is always of a different form from that of the euophryines, being placed more retrolaterally and not so small and tightly coiled. Second, other characters suggest that these troublesome dendryphantines do indeed belong with other dendryphantines, such as the lack of a concave retrolateral loop on the sperm duct in the tegulum, which may be apomorphic as noted later with respect to *Phanias,* the more basally placed tegular ledge, which may be apomorphic or plesiomorphic, and the occurrence of the cheliceral carina in at least some species (e.g., *Metaphidippus vitis*). Third, there is an apparent morphocline between the hidden spiral of *Eris aurantia* (Fig. 64b), through the more marginally open spiral of *Eris militaris* and a species near *Zygoballus incertus* (Figs. 64d, 53, 57), to the more open spiral of *Zygoballus incertus* and *Paradamoetas* (Figs. 64e, 58), to the open and well-coiled spiral of *Mabellina* and *Dendryphantes tropicus* (Figs. 62, 63, 64f). The transition would require merely a retrolateral shift of the erect portion of the embolus and a loss of sclerotization of the basal (laterally directed) portion of the embolus to leave the erect part of the embolus free, at which point it could coil as in

Dendryphantes tropicus and *Mabellina prescotti* (Figs. 62, 63).

3. Epigynal openings S-shaped, with entry toward the lateral in the anterior half and toward the medial in the posterior half (Figs. 5, 65, 67–70; Table 2, character 3). To my knowledge, this sinuate opening is unique among salticids. Though most dendryphantines have this character, it has similar problems to the preceding one and is correlated with it. A number of dendryphantines (e.g., *Eris militaris, Tutelina elegans, Phidippus clarus, Hentzia, Paradamoetas, Anicius, Zygoballus, Messua, Bagheera*) have C-shaped or simple cavernous openings. In some of these, however, ridges descending into the opening are presumably remnants of the teardrop-shaped flaps associated with the sinuate openings (*Eris militaris*, Fig. 66; *Tutelina elegans*). For some of these, there are related species that have the sinuate openings (*Eris floridana, Tutelina hartii, Phidippus* spp., *Anicius* sp., *Zygoballus tibialis*), but there remain other genera with no remnant of the flaps or obvious close relatives with sinuate openings. In general, the species lacking a compact embolic spiral also lack the sinuate openings, perhaps because a retrolateral shift of the erect portion of the embolus is correlated with an expansion of the epigynal openings and weakening of the teardrop-shaped flaps. Such a correlated change seems to mark each of *Eris militaris, Pelegrina kastoni, Dendryphantes nigromaculatus,* and *Phidippus octopunctatus* from its close relatives.

RELATIONSHIPS WITHIN THE DENDRYPHANTINAE

The limits and interrelationships of genera within the subfamily Dendryphantinae (see Table 1 for a list) are at present poorly understood. The following discussion will make an attempt to resolve only a small part of the confusion, for I will focus on those phylogenetic questions that are most important to resolve the generic placement of the *galathea* group of species, which is the subject of the species revision that makes up the bulk of this paper. The *galathea* group has resided in the genus *Metaphidippus,* but, as explained next, this genus is polyphyletic. Here I will begin (but not complete) the task of dismantling *Metaphidippus.* The *galathea* group will be moved to the genus *Pelegrina*, the *harfordii* group to *Phanias,* the *mylothrus* group to *Terralonus,* the *castaneus* group to *Ghelna,* some other species to *Messua*, but some species groups (*mannii* group, *vitis* group, various neotropical species) will remain temporarily in *Metaphidippus* for want of a better alternative. Table 3 lists the proposed reclassification of *Metaphidippus* and some other dendryphantine species.

Metaphidippus was described in 1901 by F. O. Pickard-Cambridge, who gave no clear justification for its limits. Many of the North American species that had been placed in *Dendryphantes* were subsequently transferred to *Metaphidippus,* in part because of Bryant's (1941) conclusion that these species did not belong with the Old World *Dendryphantes.* In fact, her cited evidence was mistaken: the European specimens she compared were actually "*Eris*" *nidicolens* misidentified as *D. hastatus* (Maddison, 1988). Regardless, the more or less wholesale transfer of North American species from *Dendryphantes* resulted in a *Metaphidippus* that has been desperately polyphyletic, being nothing more than a catch-all genus of unremarkable North and Central American dendryphantines spanning much of the diversity of the subfamily. Because the type species of *Metaphidippus* (*M. mandibulatus* F. O. Pickard-Cambridge) is not closely related to most species placed in the genus, including the *galathea* group, many species of *Metaphidippus* should be placed elsewhere. The relationships of the true *Metaphidippus* will first be considered, after which the limits of *Dendryphantes* and

Table 3. Summary of placements of various New World dendryphantine species apart from *Pelegrina* species, discussed in text. ? indicates placement considered possible but unconfirmed. Authors of names are given in index.

- *Bagheera*
  - *Bagheera kiplingi*
  - *B. prosper*
  - ?*Metaphidippus nigropictus*
  - ?*M. bicavatus*
- *Beata*
  - *Beata hispida*
  - *B. inconcinna*
  - *B. longipes*
  - *B. maccunii*
  - *B. magna*
  - *B. rustica*
- *Dendryphantes* (partial)
  - *Dendryphantes nigromaculatus*
  - *D. chuldensis*
  - *D. fusconotatus*
  - *D. hastatus*
  - *D. rudis*
- *Gastromicans*
  - *Gastromicans albopilosa*
  - *G. hondurensis*
  - *G. levispina*
  - *G. noxiosa*
  - *G. vigens*
  - ?*Hasarius lisei*
- *Messua*
  - *Messua desidiosa*
  - *M. centralis*
  - *M. dentiger*
  - *M. donalda*
  - *M. lata*
  - *M. laxa*
  - *M. limbata*
  - *M. moma*
  - *M. octonotata*
  - *M. pura*
  - *M. tridentata*
  - ?*Metaphidippus cupreus*
  - ?*Metaphidippus ovatus*
  - ?*Metaphidippus iridescens*
  - ?*Metaphidippus inflatus*
  - ?*Metaphidippus quadrinotatus*
  - ?*Dendryphantes felix*
- *Phanias*
  - *Phanias albeolus*
  - *P. concoloratus*
  - *P. dominatus*
  - *P. flavostriatus*
  - *P. furcifer*
  - *P. furcillatus*
  - *P. harfordii*
  - *P. monticola*
  - *P. neomexicanus*
  - *P. watonus*
  - ?*P. salvadorensis*
- *Terralonus*
  - *Terralonus californicus*
  - *T. mylothrus*
  - *T. unicus*
  - *T. shaferi*
  - *T. versicolor*
  - *T. vittatus*
  - *T. fraternus*
- *Ghelna*
  - *Ghelna castanea*
  - *G. barrowsi*
  - *G. canadensis*
  - *G. sexmaculata*
- *Metaphidippus mannii* group
  - *Metaphidippus mannii*
  - *M. carmenensis*
  - *M. chera*
  - *M. diplacis*
  - *M. emmiltus*
  - *M. tricolor*
- *Metaphidippus vitis* group
  - *Metaphidippus vitis*
  - *M. texanus*
  - *M. mathetes*
  - *Dendryphantes melanomerus*

Beata will be discussed. Then, the correct placement of various groups placed in *Metaphidippus* will be considered.

The *Bagheera* Group of Genera

It is within the *Bagheera* group, common in the Neotropics, that the true *Metaphidippus* appear to fall. Members of this group, which includes such common species known as "*Eris*" *limbata*, "*Metaphidippus*" *prosper*, "*Beata*" *albopilosa*, have a distinctive embolus, which appears, at first glance, to be coiled or curved clockwise in the left palpus, opposite the counterclockwise coiling I have said characterizes the dendryphantines and related subfamilies (Figs. 99–101). This clockwise coiling is apparently superimposed upon the normal coiling by a twisting of the embolus. The main axis of the embolus has twisted counterclockwise (as viewed from tip of embolus in left palpus), thus winding the hematodocha and sperm duct around it (Figs. 64h, 99–101). The tip of the embolus, though, seems to have been left behind by the twisting, so that the apical part of the embolus takes on a clockwise curling. In some species, this clockwise coiling is visible in the uncleared palpus (Figs. 81, 84, 87, 93), but in others it is not (Fig. 91), and the palpus is little modified from the typical compressed counterclockwise spiral of dendryphantines. The most extreme clockwise coiling is seen in "*Metaphidippus*" *prosper* (Fig. 99) and "*Beata*" *albopilosa* (see Fig. 101).

Species in the group can be sorted provisionally into three subgroups, which may or may not be monophyletic, for each of which there exists an available generic name that has been mostly ignored in the literature: *Bagheera* G. & E. Peckham, *Messua* G. & E. Peckham, and *Gastromicans* Mello-Leitão. A fourth genus sharing a twisted embolus is *Ashtabula* G. & E. Peckham, though whether or not it belongs with the group is unclear. The twisting of the embolus in *Ashtabula* (Fig. 102) is hidden beneath the tegulum and is more extreme, though similar to, that in *Bagheera*, *Messua*, and *Gastromicans*. However, there are several features that cast doubt on the placement of *Ashtabula* with these genera. *Ashtabula* has an extra concave loop on the sperm duct in the palpus, possibly placing it near the base of the subfamily as noted later in connection with *Phanias*. The body in *Ashtabula* is not nearly so large and robust as in the *Bagheera* group, instead resembling that of *Hentzia* or *Anicius*. More work is needed before the place of *Ashtabula* can be settled. Species of *Ghelna* and the *arizonensis* group of *Pelegrina* (discussed later) both have a twisted embolus, but in each it takes a very different form from the twisting in the *Bagheera* group of genera. *Sebastira*, *Thammaca*, *Lurio*, and *Parnaenus* may also belong with the *Bagheera* group of genera, though their emboli do not so obviously possess the twisting. A brief account of *Bagheera*, *Messua*, *Gastromicans* and *Metaphidippus* is here given.

Bagheera *(Figs. 80–85)*. *Bagheera* males have elongate, horizontal, *parallel* chelicerae (Fig. 80); the retromarginal teeth are near the base of the chelicera; in all but one species there is distally, near the fang, what appears to be a large retromarginal tooth but actually is not (it does not have the terminal canal through the cuticle that seems to characterize all true teeth), and most species have tubercles bearing setae on the inner margin of the basal cheliceral segment. Included in *Bagheera* are the type species, *B. kiplingi* G. & E. Peckham, 1901 (type species by monotypy; holotype examined; Figs. 80–83), and *Bagheera prosper* (G. & E. Peckham) (NEW COMBINATION; Figs. 84, 85, 99) and at least two undescribed species. *Metaphidippus nigropictus* F. P.-Cambridge and *M. bicavatus* F. P.-Cambridge may also belong in *Bagheera*.

Messua *(Figs. 86–92)*. Males of this genus have elongate *divergent* chelicerae (Fig. 86) with a long and sickle-shaped retromarginal tooth near the fang; the promarginal teeth are near the base, well separated from the retromarginal tooth; on the anterior distal margin of the basal segment of chelicera near the fang is a flange. Included in *Messua* are the type species *M. desidiosa* G. & E. Peckham, 1896 (type species by monotypy; holotype and collections of males and females from San Jose, Costa Rica examined; Figs. 86–89), *Messua centralis* (G. & E. Peckham) (lectotype here designated, a male from Chiriqui), *Messua dentiger* (F. P.-Cambridge) (see Fig. 91), *Messua donalda* (Kraus), *Messua lata* (Chickering), *Messua laxa* (Chickering), *Messua limbata* (Banks) (Figs. 90, 100, 117), *Messua moma* (F. P.-Cambridge), *Messua octonotata* (F. P.-Cambridge), *Messua pura* (Bryant), and *Messua tridentata* (F. P.-Cambridge). All these except *M. desidiosa* are NEW COMBINATIONS. *Metaphidippus cupreus* F. P.-Cambridge, *M. ovatus* F. P.-Cambridge, *M. iridescens* F. P.-Cambridge, *M. inflatus* F. P.-Cambridge, and *M. quadrinotatus* F. P.-Cambridge may also belong in *Messua*. *Dendryphantes felix* G. & E. Peckham might be considered either a *Bagheera* or *Messua* depending on any future lectotype designation: the body (G. & E. Peckham, 1901b: fig. 6a) in the type vial and its attached palpus are of a *Bagheera* species, probably *B. prosper*, while the separate palpus in a microvial (G. & E. Peckham, 1901b: fig. 6) is of a *Messua* species.

Gastromicans *(Figs. 93–95).* This genus is distinguished from *Bagheera* and *Messua* in having short and vertical but very robust male chelicerae. Included are *Gastromicans albopilosa* (G. & E. Peckham), *Gastromicans hondurensis* (G. & E. Peckham), *Gastromicans levispina* (F. P.-Cambridge) (Figs. 93–95, 101), *Gastromicans noxiosa* (Simon), and *Gastromicans vigens* (G. & E. Peckham). All these are NEW COMBINATIONS. *Hasarius lisei* Bauab-Vianna & Soares probably also belongs in *Gastromicans*. Galiano (1980) synonymized *Gastromicans* Mello-Leitão with *Beata* G. & E. Peckham because its type species *Gastromicans squamulata* Mello-Leitão (type species by monotypy) is synonymous with "*Beata*" *albopilosa*. But insofar as *Beata albopilosa* does not belong in the genus *Beata, Gastromicans* is available as a generic name for *albopilosa* and its relatives.

Metaphidippus *(Figs. 96–98).* Though the placement of the true *Metaphidippus* with these genera of the *Bagheera* group is to some extent problematical, such a placement is the best supported at present. Before discussing the uniting characters, it would be valuable to give the following brief description of the type species of *Metaphidippus, M. mandibulatus* F. P.-Cambridge (type species by original designation), whose single known male (Costa Rica, BMNH, examined), is strikingly unlike most other jumping spiders that have been placed in *Metaphidippus*. *Palpus* (Figs. 97, 98): Embolus reminiscent of that of *Eris* species but with the longitudinally directed apical portion not fully erect, instead reclined to the prolateral (Fig. 98). The embolic base bears a flange covering the basal part of the embolus. *Chelicerae:* Long and cylindrical, horizontal and diverging (Fig. 96), with two promarginal teeth near the base and one retromarginal tooth near the fang. The fang is forked near its base (Fig. 96). *Markings* (Fig. 96): Carapace brown, lacking side bands except one patch of white scales on either side of fovea. Wide white band along margin. At least some metallic green-blue scales on cephalic area. Abdomen with thin white side bands broken basally; just anterior to each of the main dorsoventral muscle attachments is a small white patch of scales; in the posterior half of the dorsum are two pairs of small lateral white bars. The dorsum has some metallic green-blue scales. *Measurements:* Body length 5.4 mm; carapace length 2.4 mm, carapace width/length 1.93/2.37.

Two features that can be proposed as synapomorphies for the group of *Bagheera, Messua, Gastromicans*, and *Metaphidippus* are the following:

1. The tibial apophysis is erect and at its base parallel-sided, shaped like a knife blade (Figs. 71–74; Table 2, character 4). Almost all other dendryphantines have an apophysis tapering throughout its length (Figs. 75–79), including *Phanias* and other genera that appear to be near the base of the subfamily (see later), and usually the apophysis points at least somewhat ventrally. The only other dendryphantines known to me with a similar knife-shaped apophysis are *Ashtabula* and *Poultonella*. *Poultonella* does not belong with these genera; rather, its peculiar chelicerae

assure a relationship with *Tutelina*. A few species of *Messua*, including *M. lata*, have a more tapering apophysis.
2. The tegular ledge runs longitudinally (Figs. 87, 90–93, 98; Table 2, character 5), instead of obliquely at 0–60° from the transverse as seen in other dendryphantines and other salticids with a tegular ledge (Figs. 40–46, 50, 52, 53). While this is unusual among dendryphantines, it is not unique: it also occurs in *Phanias*, *Anicius*, and *Zygoballus incertus*.

Additional features that suggest a relationship between *Metaphidippus* and *Messua* in particular are the long, tubular divergent chelicerae with a near-terminal retromarginal tooth and a distal anterior flange beside the fang base. Other dendryphantines have long divergent chelicerae, but in all that I have seen except some South American "*Sassacus*," the tooth arrangement is different than in *Metaphidippus* and *Messua*, with the retromarginal tooth remaining near the base or the promarginal teeth near the apex. This different tooth placement may indicate that the elongation occurred in different portions of the chelicerae in these other dendryphantines, and thus the elongation is not homologous. As well, the general body form and occurrence of greenish reflective scales are also suggestive of a close relationship between *Metaphidippus* and *Messua*, though these characters are loosely defined and not necessarily unique. The only feature that would exclude *M. mandibulatus* from *Messua* is the apparent lack of the reverse twisted embolus in *M. mandibulatus*. However, one undescribed species from Costa Rica represented by a single male specimen appears very closely related to *M. mandibulatus* in having similar body form and markings and in having a slightly forked fang, and yet it has a slightly twisted embolus (Fig. 92). If these two species form a monophyletic group, then the lack of twisting in *mandibulatus* may be a secondary loss, which is not unreasonable given that other species such as *Messua octonotata* have little trace of a twisted embolus, and the embolus of *M. mandibulatus* shows unusual folds and does recline to the prolateral as in *Messua*. Perhaps more detailed study of its peculiar embolus, when more specimens become available, will allow a more definitive answer to the question of twisting in *M. mandibulatus*. If the genus *Metaphidippus* is only an offshoot of *Messua*, then *Metaphidippus* would fall as a synonym of the older name *Messua*. However, I am reluctant to effect such a synonymy at present given the number of *Metaphidippus* species that would be left homeless, and so *Metaphidippus* will be left standing for the moment. Regardless, the best-supported conclusion at present is that the name "*Metaphidippus*" properly applies to a small group of neotropical dendryphantines related to *Messua*, *Bagheera*, and *Gastromicans*.

Two Genera That Have Exchanged Species with *Metaphidippus*: *Dendryphantes* and *Beata*

Because most species that have been placed in *Metaphidippus* do not belong to the *Bagheera* group of genera, they cannot follow *M. mandibulatus* and, thus, need to be placed elsewhere. The first place we might look for a possible home for *Metaphidippus* species are two genera, *Dendryphantes* and *Beata*, which have in the past exchanged many species with *Metaphidippus*. Many "*Metaphidippus*" were formerly placed in *Dendryphantes* and several *Beata* were formerly placed in *Metaphidippus*. To discuss the proper placement of species now in *Metaphidippus* more clearly, it would be valuable to reconsider the limits of these two genera.

Dendryphantes *(Figs. 65, 103–108, 120).* The genus *Dendryphantes*, described last century, has over the years accumulated many species, mostly on the basis of their being unremarkable dendryphantines. Many species were since moved to genera such as *Metaphidippus*, while others remaining in the genus will probably eventually be placed elsewhere (see the comments of Edwards, 1977). Among the New World species, there is only one species for which there is presently good evidence for a placement in *Dendryphantes*: *D. nigromaculatus* (Keyserling), most recently placed in *Eris* (Kaston, 1973). Several Old World species placed in *Dendryphantes,* including *D. fusconotatus* and *D. chuldensis,* appear very closely related to *D. nigromaculatus* (see figures of Prószyński, 1971b, 1982). Like the Old World *D. hastatus* (the type species) and *D. rudis, D. nigromaculatus* has a slightly elongate body dully marked. Perhaps the best character that strictly delimits *Dendryphantes* is the presence of a fold of embolic hematodocha that lies across the basal part of the embolic base, covering the wrinkles there (Figs. 103–108). If this character is used to delimit the genus, then it would be a small genus of mostly Palearctic species. The placement of *nigromaculatus* in *Dendryphantes* is further supported by its sharing with *D. rudis, D. fusconotatus,* and *D. chuldensis* a much elongated prong coming off of the base of the embolus and curving toward the cymbium (Figs. 106, 108). The embolus therefore appears to have two rami, much as in *Pelegrina flavipedes,* though not homologous according to reasoning given below. Species of the other two major groups of Old World dendryphantines, the "*Eris*" *nidicolens* group (Fig. 61) and the genus *Rhene* (Fig. 52), lack the fold across the embolic base seen in *Dendryphantes.* Though *Rhene* species often have a prong arising from the base of the embolus, in *Rhene* it is not curled toward the cymbium and, instead, is erect as in *Beata* and the *mannii* group. *Rhene* has been considered a close relative and possibly a synonym of *Dendryphantes* (Prószyński, 1973b), but a number of other features of *Rhene* such as the presence of epiandrous fusules and the concave retromarginal loop of the sperm duct of the palpus also cast some doubt on this placement.

The option of returning a number of groups from *Metaphidippus* to *Dendryphantes* has little merit at present. Moving these back to *Dendryphantes* would be useful only if they are likely to stay there, that is, if they are closely related to the type species of *Dendryphantes.* Otherwise, we would merely be worsening *Dendryphantes'* status as a catch-all genus and adding to it the confusion of changing the generic placement of many common species. As noted, only *D. nigromaculatus* among New World species is a strong candidate to stay in *Dendryphantes.*

Beata *(Figs. 77, 109–112).* The limits of the genus *Beata* have been greatly overestimated (Simon, 1903; Chickering, 1946). Because the type species of *Beata* is fissident (it has a bifid retromarginal cheliceral tooth), it has not only been removed from the dendryphantines (Simon, 1903) but has also been burdened with diverse dendryphantines that happen to have a similarly bifid tooth (Simon, 1903; Chickering, 1946). Note that the tooth is better considered a single bifid tooth rather than two fused teeth because the inner boundary of the cuticle does not extend to the tip of the second cusp. The second cusp shows all gradations of development in the dendryphantines, with most lacking it, some showing a slightly swollen margin (e.g., *Pelegrina proterva,* Fig. 10), and others having a well-developed cusp. It is therefore best to place far less emphasis on this character. *Beata magna* G. & E. Peckham (Fig. 109), the type species of *Beata* (by monotypy), bears few resemblances to most of the other fissident dendryphantines, instead having many more resemblances with the other robust-bodied dendryphantines previously placed in *Dryphias, Homalattoides,* and *Anamosa.* The following characters, which appear derived within the subfamily, delimit this group containing *Beata magna*:

1. Tibial apophysis narrow and bent toward the ventral, almost paralleling a ridge on the tibia below it (Fig. 77).

This tibial ridge is similar to that in *Pelegrina* (Fig. 78), but it is longer and sharper in *Beata*.

2. First leg tibia dark and enlarged at least slightly compared to patella, even in females.
3. Carapace distinctively wide and high, higher than in *Sassacus, Agassa,* and *Rhene,* wider than in *Sassacus* and *Agassa.* Unlike *Zygoballus,* but like *Sassacus* and *Agassa,* the carapace is wide well past the posterior eyes before it abruptly drops and narrows.
4. Carapace scales erect (in at least some but perhaps not all species).
5. Retromargin of base of embolus with prong rising parallel to apical erect portion of embolus (Fig. 110). Such a prong is also seen in *Rhene* (Fig. 52) and the *Metaphidippus mannii* group (Fig. 499).

The following species are placed in *Beata* and NEW COMBINATIONS therefore established: *Beata hispida* (G. & E. Peckham) (Figs. 77, 110–112), *Beata inconcinna* (G. & E. Peckham), *Beata maccunii* (G. & E. Peckham), and *Beata rustica* (G. & E. Peckham). Also included is *Beata longipes* F. P.-Cambridge, which may be the male of *B. magna*. *Dryphias* (type species *maccuni* by original designation) is a NEW SYNONYM of *Beata*. The genus *Beata* as here delimited excludes *B. digitata* (= *Pelegrina galathea*) and *B. variegata* (= *Pelegrina variegata*), *B. albopilosa* (= *Gastromicans albopilosa*), *B. flavolineata* (= *Nagaina incunda*), *B. cephalica* F. P.-Cambridge, *B. jubata* (C. L. Koch), *B. munda* Chickering, *B. pernix* (G. & E. Peckham), *B. venusta* Chickering, *B. wickhami* (G. & E. Peckham), and *B. zeteki* Chickering. No new placements are suggested for the last-mentioned seven species. Other species placed in the genus but probably not belonging there are *B. cinereonitida* Simon, *B. germaini* Simon, *B. lineata* (Vinson), and *B. striata* Petrunkevitch.

The Proper Placements of *Metaphidippus* Species

Now that the relationships of the true *Metaphidippus* and the limits of *Dendryphantes* and *Beata* have been reconsidered, we are in position to discuss how the various groups within *Metaphidippus* might be dispersed. Some of these conclusions are summarized in Table 3.

Four groups are here removed from *Metaphidippus,* as discussed in subsequent sections. The *galathea* group is transferred to the genus *Pelegrina* (and its species revised), the *harfordii* group to the genus *Phanias,* the *mylothrus* group to the new genus *Terralonus,* and the *castaneus* group to the new genus *Ghelna.*

Two species groups occurring in the United States are retained temporarily in *Metaphidippus* pending further study: the *mannii* group and the *vitis* group. The *mannii* group is discussed later in connection with the revision of its U.S. species. The status of the *vitis* group (Figs. 27, 59), including *Metaphidippus vitis* (Cockerell), *M. texanus* (Banks), *M. mathetes* (Chamberlin), and *Dendryphantes melanomerus* Chamberlin, is not clear. These species have a characteristic hooked embolus (Figs. 27, 59) and are small, somewhat elongate, and brown to black and shiny. *Metaphidippus vitis* was placed in *Sassacus* by Hill (1979) on the basis of scale morphology and courtship, but scale morphology is known in only few dendryphantines, and a similar courtship is also seen in many other dendryphantines (raisedforward, Table 2, character 9). Furthermore, the genitalia of *M. vitis* are very different from those of the true *Sassacus* and, instead, are similar to those of the neotropical species placed in *Sassacus* such as *S. arcuatus,* which may better be placed in the genus *Ramboia* (see Bauab-Vianna and Soares, 1982). The *vitis* group, here retained in *Metaphidippus,* may eventually find its place in a primarily neotropical genus.

Some species placed in *Metaphidippus*

belong in *Bagheera* or *Messua*, as already noted. *Metaphidippus paiutus* Gertsch is a *Sassacus* (*Sassacus paiutus* (Gertsch), NEW COMBINATION), possibly a synonym of *S. papenhoei*. Other species of *Metaphidippus* require further study before their placement can be settled. Among the neotropical species listed under *Metaphidippus* by Bonnet (1957), *M. longipalpus* F. P.-Cambridge, *M. nitidus* (G. & E. Peckham), and perhaps *M. taylori* (G. & E. Peckham) seem to belong to *Parnaenus, M. pallens* F. P.-Cambridge in *Eris, M. perfectus* (G. & E. Peckham) (Fig. 60) in *Selimus*, and *M. tropicus* (G. & E. Peckham) (Fig. 62) in *Bryantella*. For the remaining neotropical species (see Prószyński, 1990), I have no placement to suggest.

Phanias F. P.-Cambridge, 1901

Type species, *Phanias flavostriatus* F. P.-Cambridge, 1901, by monotypy.

The unusual, elongate dendryphantines of the *harfordii* group (Figs. 20, 36, 47, 70) include several species in the western United States but many more in the highlands of México. A generic name is available for this group, *Phanias* F. P.-Cambridge, 1901, based on *Phanias flavostriatus*, described from two females from Omilteme, México (BMNH, examined), and previously considered to belong in the Marpissinae. The species of the *Metaphidippus harfordii* group are therefore transferred to *Phanias*. The members of the genus *Phanias* share these characters, which may be apomorphies within the subfamily:

1. Tegular ledge expanded so as to cover the tegular shoulder (Fig. 47). The tegular ledge of other dendryphantines and other salticids is not so expanded.
2. Embolic hematodocha reduced and sclerotized prolaterally and basally. In at least some species, much of the expansion occurs from out of the tegular ledge instead of from the prolateral dorsal surface (back side) of the tegulum (Fig. 36), but this feature may be primitive as it is also found in *Synageles* and *Admestina* (Figs. 29, 30).
3. Courtship with first legs raised, forward, and parallel (Fig. 118) and waved asymmetrically so that the leading leg on sidles is waved exclusively or more strongly (seen by me otherwise only in *Anicius*).
4. Small blunt teeth on the embolus (Fig. 20). Many other dendryphantines (e.g., *Pelegrina montana*, Fig. 204) have teeth on the embolus, but their teeth are sharp. The blunt teeth are lacking, however, in some species of *Phanias* (e.g., *P. watonus*).
5. Longitudinal bands of white scales, instead of passing below and beside the posterior eyes as in other dendryphantines, pass around and directly posteriorly from the posterior eyes. The distribution of this character is not well known.

The following NEW COMBINATIONS are established: *Phanias albeolus* (Chamberlin & Ivie) (Figs. 20, 70), *Phanias concoloratus* (Chamberlin & Gertsch), *Phanias dominatus* (Chamberlin & Ivie), *Phanias furcifer* (Gertsch), *Phanias furcillatus* (F. P.-Cambridge), *Phanias harfordii* (G. & E. Peckham) (Fig. 47), *Phanias monticola* (Banks), *Phanias neomexicanus* (Banks), and *Phanias watonus* (Chamberlin & Ivie). *Phanias marginalis* Banks (type specimen examined) is a *Menemerus*, not a *Phanias*, while *Phanias salvadorensis* Kraus may be either a *Phanias* or an *Anicius*. Also included in *Phanias* are at least 15 undescribed species from México and the southwestern United States. *Phanias* may be placed near the base of the subfamily, for it has two features that are arguably ancestral for the subfamily, namely, the presence of epiandrous gland fusules (Machado, 1951; Table 2, character 6; see also Maddison, 1988), which it shares with *Hentzia*, "*Beata*" *wickhami*, "*Eris*" *nidicolens*, *Rhene*, and groups apparently related to dendryphantines (euophryines, synagelines, ballines, *Mopsus*, *Itata*, *Phle-*

gra, though not *Neon*), and a concave sperm duct loop along the retromargin of the tegulum (Fig. 20), which it shares with some *Hentzia, "Eris" nidicolens* (Fig. 61), *Rhene* (Fig. 52), some *Tutelina, Anicius,* euophryines (Fig. 19), and *Admestina.*

Terralonus new genus

Type species, *Dendryphantes mylothrus* Chamberlin, 1925, here designated. Name treated as masculine.

Description and Diagnosis (Figs. 22, 44, 68). These western North American species are unusual among dendryphantines in being ground-dwelling, usually on ground more or less barren of vegetation, often under rocks. The body shape and markings are distinctive and uniform throughout the group. They are somewhat elongate and have relatively low-contrast mottled markings of coarse brown or gray pubescence. The embolus is long and its base is more longitudinally directed than is usual in dendryphantines (Fig. 22), except for *T. californicus,* which has a more typical embolus (Fig. 44).

Included Species. The following species are moved to *Terralonus*: *Maevia californicus* G. & E. Peckham, *Dendryphantes mylothrus* Chamberlin, *Dendryphantes unicus* Chamberlin & Gertsch, *Metaphidippus shaferi* Gertsch & Riechert, *Icius versicolor* G. & E. Peckham, *Menemerus vittatus* Banks, and *Menemerus fraternus* Banks (type specimens of last-mentioned three species examined). This establishes the NEW COMBINATIONS: *Terralonus californicus* (G. & E. Peckham), *Terralonus mylothrus* (Chamberlin), *Terralonus unicus* (Chamberlin & Gertsch), *Terralonus shaferi* (Gertsch & Riechert), *Terralonus versicolor* (G. & E. Peckham), *Terralonus vittatus* (Banks), and *Terralonus fraternus* (Banks).

Discussion. By appearance, these are not typical dendryphantines—two of the species were described in the genus *Menemerus* and have remained there to this day. Their relatives are unclear, but almost certainly they do not belong in the genus *Metaphidippus,* because they lack the characters of the *Bagheera* group of genera. I have chosen to describe a new genus for the group to remove it from its uneasy placement in *Metaphidippus.* I do this with some hesitation, given the overabundance of obscure genera in salticids, but the *mylothrus* group apparently does not reach the Neotropics where it might have found an available generic name, and so it is unlikely to be synonymized soon. Describing a genus allows easier discussion of this distinctive group. The three species associated with the group for the first time (*fraternus, vittatus,* and *versicolor*) can therefore be moved directly into *Terralonus* without being temporarily sentenced to *Metaphidippus.*

Ghelna new genus

Type species, *Attus castaneus* Hentz, 1846, here designated. Name treated as feminine.

Description and Diagnosis. These eastern North American species, like the species of *Terralonus,* are ground-dwelling, though in more mesic habitats. They share a dark granulate carapace with fine golden scales, posterior lateral spines on the first tibia displaced anteriorly, reduced spines on the first femora, first coxae nearly touching, and the female palpus slightly swollen. The embolus, at least in the first two species mentioned and perhaps in all, is twisted so as to wind the embolic hematodocha around the embolus much as in the *Bagheera* group of genera, though the twisting takes a very different form.

Included species. The species *Attus castaneus* Hentz, *Metaphidippus barrowsi* Kaston, *Icius sexmaculatus* Banks, and *Icius canadensis* Banks are here moved to *Ghelna* to establish the following NEW COMBINATIONS: *Ghelna castanea* (Hentz), *Ghelna barrowsi* Kaston, *Ghelna sexmaculata* (Banks), and *Ghelna canadensis* (Banks).

Discussion. As with *Terralonus,* the relatives of *Ghelna* are unclear but, likewise, are not near the genus *Metaphidippus*. The justification for a new generic name is similar to that for *Terralonus*.

THE GENUS *PELEGRINA* FRANGANILLO, 1930

Pelegrina Franganillo, 1930: 44. Type species by original designation and monotypy *Pelegrina geniculata* Franganillo (= *P. proxima*).

Notes on Synonymy. The problem of the generic name to be given to the *galathea* group was not an easy one to solve. In my thesis (Maddison, 1988), I concluded that a new generic name was needed for the group, because (1) it clearly does not belong with *Metaphidippus* and (2) the group is arguably monophyletic and of respectable size for a genus, and (3) it appeared that there was no genus whose type species fell within the group. However, subsequent investigation has indicated that an obscure Franganillo name, *Pelegrina*, should be applied to the *galathea* group. Although the revival of obscure names is often undesirable, in *Pelegrina*'s case there is little harm because no other published name is available for the group. In 1930, Franganillo described *Pelegrina* and based it on *Pelegrina geniculata* Franganillo, which he placed in the section Unidentati, subfamily Heliophaninae. As discussed under the description of *P. proxima*, *P. geniculata* is here considered a junior synonym of *Dendryphantes proximus* G. & E. Peckham; thus, the name *Pelegrina* is applicable to the *galathea* group.

Description and Diagnosis. Small to medium-sized dendryphantines distributed throughout North and Central America. *Males* (Fig. 1) typically brown with longitudinal bands of white scales on either side of the carapace and abdomen. The inverted white V-shaped marking on the forehead that contacts the AMEs distinguishes *Pelegrina* from most other dendryphantines, though it is not present in all *Pelegrina*. Legs often with annulate markings. The relatively wide embolus with the tip expanded retrolateral to its opening and bearing two rami (Figs. 3, 190–216, 220–224) is generally a good diagnostic feature for the genus, but it is absent in a number of species. Tibial apophysis stout; just ventral to apophysis is usually a ridge (Fig. 78), developed into a second apophysis in some species (*furcata* group) or a wide flange in other species (*arizonensis* group). *Females* gray, yellow, or brown with mottled markings of four prominent pairs of pale spots on the abdominal dorsum (see, e.g., Figs. 2, 263, 269, 358, 382). Epigynal openings relatively long. Among small dendryphantines, the species of *Pelegrina* have perhaps the best-developed epigynal flaps (Figs. 236–255), which are the teardrop-shaped lateral rims of the openings. The flaps are usually convex and overlap the medial rim of opening. All species of *Pelegrina* examined have the same chromosome complement, $2n♂ = 26 + XXO$, as is prevalent throughout the family.

Monophyly. Thirty-eight species are included in *Pelegrina*. Most of these species can be easily recognized as belonging to the genus by an experienced identifier on the basis of body form, size, and markings, but to articulate precisely characters that could serve as evidence for monophyly is more difficult. The following characters support the monophyly of the genus, though none provides a simple, strict delimitation. Some of the characters delimit a group slightly smaller than the genus, others a group slightly larger. Thus, each character provides only indirect and partial evidence for monophyly.

1. Embolus with two terminal rami retrolateral to opening (Figs. 3, 190–216, 220–224). The sperm duct opening lies on the prolateral side of the embolus, often below the tip. Retrolateral to the opening are two rami, one just distal to the opening; the other often elongate (see especially *P. tristis*, Fig. 197) and forming the retrolateral tip of the embolus. While other dendryphantines such as *Tulpius*, *Phanias*, and *Tutelina*

have accessory rami emerging from the embolus, none have such rami in the position or form seen in *Pelegrina*. This is perhaps the clearest character delimiting the genus, but some *Pelegrina* appear to lack it (*verecunda, tillandsiae, bunites, orestes, arizonensis, helenae*; Figs. 217–219, 225–227), while others have the rami but in a much modified form (*flavipedes* and related species; Figs. 201–203). These problems are discussed later.

2. Hematodocha of embolus bulges as far distally as the base of the erect portion of the embolus (Fig. 3; Table 2, character 7). This feature is present throughout *Pelegrina*, including *P. orestes* and *P. bunites*. In other dendryphantines examined, including the *mannii* group and *Eris*, the hematodocha joins the retrolateral edge of the embolic base more basally so that the hematodocha fails to bulge as far distally (Figs. 22, 23).
3. Epigynal flaps well developed, long, and wide and not descending into the opening posteriorly. This character is difficult to assess, for there are other dendryphantines with well-developed flaps, though in these the flaps do not exactly match those of *Pelegrina*, being either much shorter (*Phidippus*, Fig. 67; *Bellota*), narrower (*Beata*; Figs. 109, 112), or less convex (e.g., "*Pseudicius*" *siticulosus*). The flaps of most *Pelegrina* differ from those of the *mannii* group and *Eris*, which have weak flaps that descend into the opening at posterior end (Figs. 66, 256, 257); the flaps in the two most problematical *Pelegrina* species, *P. bunites* and *P. orestes*, are somewhat like those of the *mannii* group.
4. Wrinkles present on anterior margin of male cheliceral fang (Fig. 11; Table 2, character 8). Running parallel to the serrate edge of the fang (Hill, 1977b), just anterior to it, is a line of transverse wrinkles, which appears like an irregular secondary serrate edge. In *Pelegrina*, except *P. orestes*, it reaches distally to the fang opening. This contrasts with *Dendryphantes*, the *mannii* group, and most other dendryphantines, which lack such wrinkles. The only other salticids seen with such a "secondary serrula" are (a) *Phanias* (four species examined), in which the wrinkles are restricted to a depression that does not reach the opening; (b) *Selimus* sp. and "*Beata*" *octopunctata*, in which the wrinkles are long and regular; and (c) *Eris militaris*, in which the wrinkles do not quite reach the opening. Except for *E. militaris*, the wrinkles are of different form, suggesting they are not homologous.
5. Distinct cheek bands on the male face (Figs. 1, 258, 264, and so on). Though other dendryphantines may have pale scales on the side of the face under the ALEs, in most these pale scales do not form a distinct band separated from the side bands by a dark area. Such a separation of the cheek and side bands is also seen in some species of the *mannii* group (Figs. 493, 514, 534). It is lacking in other dendryphantines except one species from Venezuela examined, possibly an *Admirala* sp., though the character has not been surveyed intensively. Some species of *Pelegrina* (*P. variegata*, Fig. 447), however, do not have a distinct cheek band.
6. An inverted V-shaped mark of pale scales on the forehead, contacting the AMEs (Figs. 1, 258, 264, and so on). Most *Pelegrina* males show this forehead band, though some lack it (e.g., *P. aeneola*). While the character has not been surveyed thoroughly, it is lacking in other dendryphantines except for a few species (e.g., *Tutelina hartii*).
7. Male courtship with prolonged "crouch" display. In the courtship of *Pelegrina*, *Eris militaris*, the *Metaphidippus mannii* group, and *Nagaina incunda*, there is a *crouch* display, in which the first legs are held low and forward, usually horizontal and below

the level of the body (Figs. 125–128, 134, 140, 162 for *Pelegrina*; Figs. 124, 178, 184 for *Eris* and *mannii* group; Peckham and Peckham, 1889; Richman, 1982: fig. 3; Table 2, character 9). The more distal segments may be raised (e.g., *Pelegrina kastoni*, Fig. 140), but at least the femur is low. The male proceeds toward the female in this pose, waving the first legs at low amplitude if at all. The body is held horizontal, in many species close to the substrate (hence the name "crouch"). This pose contrasts with that seen in most other dendryphantines (Table 2; Peckham and Peckham, 1889, 1890; Crane, 1949a; Richman, 1982; Jackson, 1978; Hill, 1977a; and my own unpublished observations on about 50 species in which the first legs are generally raised and spread (the *raisedspread* display, Figs. 113–115, 121; e.g., *Phidippus, Paradamoetas, Zygoballus*) or raised and held forward (the *raisedforward* display, Figs. 118–120; e.g., *Phanias, Sassacus papenhoei, Dendryphantes nigromaculatus*), or held horizontal and spread very wide (the *lowspread* display, Figs. 116, 117; e.g., *Messua limbata, Tulpius*). The distinctions among these poses are, of course, vague. It should be noted that *Pelegrina* does have a raisedspread display, generally performed with the carapace held high and the abdomen low, but this is performed usually when the male is far from the female. A *Pelegrina* male thus often begins with a raisedspread display and then proceeds to a crouch display as he approaches the female. Insofar as other dendryphantines often reach with the legs parallel, forward, and low just before mounting and copulation (stage II courtship, Crane, 1949b), as in the crouch display, it may be claimed that the crouch display is merely stage II courtship and, thus, not restricted to *Pelegrina* and relatives. Indeed, the crouch display may represent a prolonged stage II. If so, however, it is still distinctive from the brief stage II seen in other salticids, in being much more prolonged, performed farther from the female, and having a more rigid appearance. The crouch display has been observed in all *Pelegrina* and *mannii* group species examined, with the following exceptions: in *P. furcata* a strikingly different display (the semaphore display) is seen, whereas in *Pelegrina arizonensis, P. chalceola,* and *Metaphidippus diplacis* only a raisedspread display was seen. The lack of observed crouch display in these latter species calls attention to the difficulty of using the character. When seen, the crouch display is distinctive and can be considered present. However, when not seen, it may still be characteristic of the species but not observed because the male simply failed to perform it, remaining longer than usual in the raisedspread display. Nevertheless, the crouch display was scored as absent in these *Pelegrina* species because the males were observed for a reasonable sample of displays. Another problem with the character is the occurrence of a similar first leg pose in *Tutelina* and *Hentzia* (Figs. 122, 123). However, the exact leg poses and motions in these other genera differ in a number of respects from those of *Pelegrina*.

8. Ridge under tibial apophysis (Figs. 78, 389, 421, 427; Table 2, character 10). Under the tibial apophysis is a ridge that in extreme cases can make the apophysis appear bifid (e.g., *Pelegrina bicuspidata*). The ridge is present throughout *Pelegrina* (except *flavipedes* and similar species) but is also present in some species of the *mannii* group (*mannii, diplacis*), *Beata* (Fig. 77), and in *Tulpius hilarus*. It is poorly developed in *Eris militaris* (Fig. 79), *Bellota wheeleri*, and *Metaphidippus vitis*. It is lacking in other dendryphantines including *Dendryphantes* (Figs. 75, 76).

The preceding characters give reasonable support to the monophyly of the genus *Pelegrina*, though none provides a strict delimitation. Even if the genus as constituted here is not monophyletic, the characters provide good evidence that it is at least mostly monophyletic, to the extent that monophyly could probably be achieved by including or excluding only a few troublesome species. The following discussion regards the *Pelegrina* species that fail to show some of the characters supposedly delimiting the genus and why I have chosen to include these species in the genus. Whether or not species in the *mannii* group might be included in *Pelegrina* is discussed in the introduction to the revision of the species of the *mannii* group.

Pelegrina arizonensis and *P. helenae*. These species lack the two rami on the embolus. Instead, the embolus is blade-shaped, shifted retrolaterally, and concave on the exposed (ventral) surface (Figs. 217, 218, 422, 428). However, there are a number of other characters that would otherwise place the two species within *Pelegrina*. These species have distinct cheek and forehead bands, a ridge just ventral to the tibial apophysis, and the male fang with wrinkles as in other *Pelegrina*. The peculiar embolus might be derived from that of a typical *Pelegrina* embolus by twisting about its longitudinal axis so as to reverse pro- and retrolateral edges and to present the embolus's concave surface, normally facing inward to the cymbium, outward toward the front. This is indicated by the presence of a ridge cutting across the face of the embolus joining the prolateral surface of the base with the retrolateral edge of the embolus, the position of the opening on the retrolateral side, the concave exposed face of the embolus, and a pronounced furrow on the embolis hematodocha as if folded inward. Cutler and Jennings (1985) noted that "internal epigynal structure of his [Prószyński, 1982:1] D[*endryphantes*]. *czekanowskii* bears a close resemblance to the internal epigynal structures seen in the *M. arizonensis* group." Perhaps the similarity they noticed was the looping of the duct just inside the opening. The epigynum of *D. czekanowskii* is much like that of *D. nigromaculatus* and *D. fusconotatus*. This looping in both *Dendryphantes* and the *arizonensis* group is related to the rotation of the epigynal flaps medially at the posterior end. In *Dendryphantes*, the rotation reaches 90°; in the *arizonensis* group, it is much more extreme, 180–270°. This rotation must not be considered a critical character; similar rotations are seen in the *Pelegrina pervaga* group (*P. kastoni*), in *Phidippus octopunctatus*, and in *Agassa* (as compared to *Sassacus*). Indeed, in other respects the epigyna of the *arizonensis* group and *Dendryphantes* are rather different, with the flaps being on the surface in the former (as in other *Pelegrina*, Fig. 251), whereas they descend beneath the opening as a simple ridge in the latter (Fig. 65).

Pelegrina flavipedes, *P. flaviceps*, and *P. exigua*. The biramous embolus of this group (Figs. 201–203) might be interpreted either as arising from an embolus like that of *Pelegrina sabinema* (Fig. 198) by more deeply splitting the two terminal rami of the embolus or as arising from an embolus like that of *Dendryphantes rudis* and *D. nigromaculatus* (Figs. 106, 108) by prolongation of the retrolateral projection on the shoulder of the embolus. The *flavipedes* group lacks a ridge under the tibial apophysis, which otherwise seems characteristic of *Pelegrina*, thus supporting the interpretation that the *flavipedes* group does not belong with *Pelegrina*. However, there is more compelling evidence that the *flavipedes* group is derived from within *Pelegrina*. Like the *pervaga* group, the *flavipedes* group members are conifer dwellers with yellow chelicerae. Like *Pelegrina*, they have wrinkles anterior to the fang serrula and an embolic hematodocha bulging distally, cheek bands on the male face, and a crouch display in male courtship (Fig. 127). Like *Pelegrina* and a few other dendryphantines, the embolic base is well sclerotized, with few wrinkles over most of its exposed surface. Finally, if the *flavipedes* group were derived from those *Dendryphantes* with long retrolateral prolongations on the embolus shoulder (*rudis, nigromaculatus*), the group should have the synapomorphy for *Dendryphantes,* the fold across the embolic base. The *flavipedes* group lacks this fold.

Pelegrina furcata. This species has two terminal rami on the embolus, robust epigynal flaps, and cheek bands, but its courtship display is unlike that of any others in the genus. The first legs are held wide and high, unlike *Pelegrina, Eris militaris,* and the *mannii* group, but like most other dendryphantines, and waved in a distinctive semaphore-like fashion (Fig. 121).

Pelegrina verecunda. Arizonan specimens lack the two distinct terminal rami on the embolus (Fig. 219), but Chihuahuan specimens identified as this species have the rami.

Pelegrina tillandsiae. This species lacks the two terminal rami on the embolus (Fig. 225) and is in many respects atypical. It is tentatively included in *Pelegrina* because its epigynum shows strong flaps that, as in *Pelegrina,* do not descend into the openings (Fig. 254).

Pelegrina orestes and *P. bunites.* These species present the greatest problems with inclusion in *Pelegrina,* and I might have treated them as belonging to the *mannii* group or elsewhere. They lack the two terminal rami on the embolus characteristic of *Pelegrina* (Figs. 226, 227), though at least in *P. orestes* the embolus is obliquely truncated distal to the opening and has one ramus well separated from the opening. On the other hand, the epigynal flaps of *bunites* are flatter and narrower than in other *Pelegrina,* more as in the *mannii* group (Figs. 225, 481). *Pelegrina bunites,* though, lacks the bulge above the tibial apophysis characteristic of the *mannii* group and has three characters that might argue for the placement of *bunites* in *Pelegrina*: the occurrence of wrinkles on the cheliceral fang, the bulging of the embolic hematodocha to the shoulder of the embolus, and the forehead band contacting the AMEs. On balance, then, a case can be made for tentatively describing *bunites* in *Pelegrina.* The situation with *orestes* is more difficult. *Pelegrina orestes* lacks the cheliceral fang wrinkles of *Pelegrina,* and one character, the presence of a ridge on the chelicera (Fig. 483), gives positive evidence to place *orestes* in the *mannii* group, though the ridge is especially weak and not present in all males. However, *orestes* lacks the bulge just dorsal to the tibial apophysis characteristic of the *mannii* group and does have the bulging embolic hematodocha characteristic of *Pelegrina.* Because of this, *orestes* will be described in *Pelegrina,* though it may eventually have to be moved.

Natural History. Species of *Pelegrina* are found in various habitats from the Arctic to the tropical lowlands of Central America. While most species in Mexico and Central America appear to occur in the highlands (cloud forest and oak-pine zones), there are some lowland tropical species (*P. sandaracina* and *P. yucatecana*). All species in the genus are primarily dwellers on foliage, being only occasionally found on the ground. Most other dendryphantines are also foliage dwellers, though some dendryphantines, in particular those with more elongate and dully marked gray or brown bodies, are ground or bark dwellers (*Terralonus, Ghelna,* some *Phanias* species). A number of species of *Pelegrina* appear to be most common on or restricted to particular sorts of plants: the *flavipedes* group to various confiers, the *pervaga* group and *P. balia* to junipers, *P. clemata* and *P. helenae* to sagebrush (*Artemisia tridentata*), and *P. tillandsiae* to spanish moss (*Tillandsia usneoides*). Other species do not appear so specialized to particular plants, yet in my collecting they do seem to prefer certain habitats: *P. proterva* occurs in forest understory, at least in the south of its range; *P. galathea,* in fields; *P. variegata,* in desert scrub; *P. montana,* in streamside vegetation; and *P.*

insignis, on low plants in fields and bogs. A number of southwestern species are most commonly collected from oaks. One generalist species is *P. aeneola*, which is found on trees and herbs of various sorts in the Pacific Northwest, though not usually in the arid regions. The silken retreats and egg sacs are constructed among the foliage on which the adults are collected.

PHYLOGENY WITHIN *PELEGRINA*

While insufficient evidence was found to indicate the basal divisions of *Pelegrina*, the delimitation of a number of smaller groups can be made (see cladogram given in Fig. 129). One clearly delineated group is the *flavipedes* group, whose three members (*flavipedes*, *flaviceps*, and *exigua*) share the following characters derived within the genus:

1. Embolus deeply bifid (Figs. 201–203). All other species of *Pelegrina* have the division between the terminal rami of the embolus not nearly so deep as in the *flavipedes* group. Other dendryphantines have either a simple embolus or one with accessory rami different from those in *Pelegrina* and the *flavipedes* group.
2. Chelicerae of male yellow with dark spot in medial concavity (Figs. 319, 324, 329, 334). The dark concavity is unique to this group.
3. Asymmetrical circling of palps in male courtship. During the crouch display, the palps are waved fairly slowly at high amplitude in circles such that as one is rising the other is falling (Fig. 127). Though other *Pelegrina* may wave their palps out of phase, in none examined is this asymmetrical waving made so obvious by the large slow waves. No other dendryphantines examined have such waving, except some *Phidippus*.

Another group similarly well defined is the *pervaga* group, consisting of *pervaga*, *sabinema*, and *kastoni*, which share the following:

1. Distinct markings on yellowish male palpus, consisting of prominent patches of white scales on the femur, tibia, and cymbium, interrupted by dark hairs on the patella. Other *Pelegrina* have no white scales on the tibia, or fewer on the tibia than on the patella.
2. Cheek band extended posteriorly parallel to the side band, separated from the side band by dense band of dark hairs (Figs. 304, 309, 314). This yields the appearance of white-black-white carapace side bands. Other *Pelegrina* have dark setae between side and cheek bands, but in none is the cheek band so horizontal and the dark hairs so dense. One species in the *mannii* group, *Metaphidippus emmiltus*, has a superficially similar pattern.

These two groups, the *flavipedes* and *pervaga* groups, may together form a monophyletic group, as delimited by the following:

1. Chelicerae yellow in males. Other *Pelegrina* have dark brown chelicerae except southern males of *P. tillandsiae*. Brown chelicerae are present in other similar dendryphantines such as *Eris*, *Nagaina*, *Beata*, and the *mannii* group except *Metaphidippus emmiltus*, which also has yellow chelicerae.
2. Conifer dwelling. All members of the *flavipedes* group, and *P. pervaga* and *P. kastoni*, are known to dwell more or less exclusively on conifers. The habitat of *P. sabinema* is unknown. This contrasts with the habitat of most other *Pelegrina*, which inhabit broadleaf trees, shrubs, and herbs. However, *P. proterva*, *P. aeneola*, and *P. furcata* are known to frequent conifers, whereas *P. balia* appears restricted to conifers. Also, the polarity of this character is unclear. Outside the genus, *Metaphidippus emmiltus* is a juniper dweller, whereas *Eris* species are often collected from conifers.

The *neoleonis* group, including *tristis* from Arizona and *neoleonis* from México, is distinguished by the broad, dark rotated epigynal flaps. Though their appearance is much more like that of typical brown-legged *Pelegrina*, they share the following characters with the preceding two groups of yellow-legged species:

1. Retrolateral ramus of embolus much elongate and curled to the prolateral (Figs. 196–203). The only other *Pelegrina* with such a long ramus is the *furcata* group, though in that group all but one species have it curling to the retrolateral. The exception is *morelos*, which has a prolateral curl (Fig. 215), but because it seems very close to *furcata* the prolateral curl is probably convergent.
2. Embolus very broad. Such a broad embolus is not found in other *Pelegrina* except *peckhamorum*.
3. First curve of duct of epigynum broad. Though unusual, a duct as broad is found in *P. huachuca* and *P. morelos*.

The relationships of this proposed *flavipedes-pervaga-neoleonis* clade are not altogether clear, though the sickle-shaped retrolateral ramus of the embolus of *proterva*, *galathea*, *edrilana*, and *pallidata* may be viewed as a preliminary version of the very long ramus of this clade. Most of these species together with *dithalea*, *proxima*, and *peckhamorum* have an angle on the embolus just basal to the tip of the retrolateral ramus (Figs. 259, 265, 271, 277, 283, 289, 310) which may be a synapomorphy for a large clade (Fig. 129), but whether or not the angle is absent from all other *Pelegrina* is unclear (e.g., see Fig. 215).

Another clearly delineated group is the *arizonensis* group (Cutler and Jennings, 1985), including the two species *P. arizonensis* and *P. helenae*. The apomorphies supporting the group are as follows:

1. Epigynal flaps far rotated, at least 180° (Figs. 424, 430). No other dendryphantines known to me have a similar rotation; flap rotations in *Terralonus* and *Ghelna*, for example, are in the opposite direction.
2. Erect portion of embolus displaced to retrolateral side and tegulum rotated somewhat clockwise (Figs. 422, 428). The embolus displacement is seen in some other dendryphantines, but the tegulum rotation is perhaps unique.
3. Embolus twisted about longitudinal axis so as to reverse pro- and retrolateral edges and to present the back side forward.
4. Ridge under tibial apophysis uniquely developed into flange (Figs. 421, 427).
5. Markings of female abdomen somewhat lineate (Figs. 425, 431). Lineate markings are also seen in *P. tillandsiae* and the *Metaphidippus mannii* group.

The *furcata* group of Central America and southwestern North America includes the widespread and common *P. furcata* as well as a number of rare species (*huachuca*, *morelos*, *bicuspidata*, *volcana*, *ochracea*). Apomorphies supporting the group are as follows:

1. Ridge under tibial apophysis unusually strongly developed, so as to form a second apophysis (Fig. 389; even stronger in the other species in the group). This is found in all species, although it is lacking in some specimens of *furcata*.
2. Wrinkles on the retrolateral basal edge of the embolic base either transverse or ascending apically toward the retrolateral (Figs. 390–394, 404, 406, 411, 416). This contrasts with the wrinkles of other *Pelegrina* and similar dendryphantines, which have wrinkles descending basally toward the retrolateral. *Pelegrina insignis* may have wrinkles similar to those in the *furcata* group.
3. Epigynal flaps very convex, unlike other dendryphantines except *Pelegrina proxima* and *peckhamorum*.
4. Epigynum concave behind flaps, unlike the case in *Eris*, the *mannii* group, and *Nagaina*, though also seen in *Pelegrina proxima*, *peckhamorum*, and *balia*.

Pelegrina furcata itself has a very peculiar courtship display. Whether or not this feature is shared by other members of this group awaits their examination.

The montana group includes three species: *montana*, *insignis*, and *chaimona*. These species share the following:

1. Concavity on back of embolus restricted to distal half of erect portion. In other *Pelegrina* species, the concavity on the back of the embolus (Figs. 7, 34, 35) extends from the base of the erect portion to its tip. Some *Pelegrina*, however, have no clear concavity at all (e.g., *P. aeneola*, *P. chalceola*).
2. Small, sharp denticles on front surface of embolus (Figs. 204–206). Other dendryphantines have denticles on the embolus, but they are usually on the retrolateral surface or are of different form. This character has not been well surveyed, however.

Among the remaining species of *Pelegrina* are many that have a narrow embolus with small rami (*aeneola*, *clemata*, *chalceola*, *balia*, *variegata*, *verecunda*, *sandaracina*, and others). However, this may be the primitive condition for the genus. No clear subgroups were found among these species.

IDENTIFYING SPECIES OF *PELEGRINA* AND THE *METAPHIDIPPUS MANNII* GROUP

In general, the genitalia provide the best means of identifying species, but facility in recognizing the distinguishing features may require some experience. Males are much more easily identified than females, as the palpus and face markings provide more readily described and interpretable differences than the differences in epigyna. Take note especially of the width of the erect portion of the embolus and the size and orientation of the two terminal rami. Indeed, it is usually possible to identify males simply by referring to the two pages of Figures 190–235. A single key for all species is given for males.

Females, however, pose many more problems for identification. Though the abdominal markings and epigyna of females vary in a number of features, the differences can be subtle and difficult to describe. One might think of the abdominal markings as falling in two major categories: those in which the paired white spots dominate the dorsum (Figs. 263, 275, 293, 382, 441, 451) and those in which the dark patches between and beside the white spots dominate the dorsum (Figs. 281, 287, 347, 358, 364, 377, 387). Epigynal features to note are the topography of its surface and the size, convexity, color, and placement of the teardrop-shaped flaps covering the openings. Even once experienced with these characters, an identifier can still have difficulties with some specimens. The problems are lessened within a given geographical region. Because of this, separate female keys are given for five regions: the eastern United States and Canada, the Great Plains, Pacific Coast Untied States and western Canada, Arizona and México, and Central America. Parts of the southwestern United States are therefore without a key to females of *Pelegrina*, namely, Texas and the Rocky Mountain states. For Montana and Wyoming, the Pacific Coast key can be used (except possibly for prairie species). For Colorado, Utah, and New Mexico, most identifications can be accomplished using the Pacific Coast and Arizona keys, though the Great Plains key will be needed occasionally. For Texas, the Arizona and Great Plains keys will usually suffice, but the eastern United States key will be needed on occasion. In general, *mannii* group females are not included in the keys. *Metaphidippus mannii* is included in the Pacific Coast key, but five other species in the group that occur in southern California are not included; *mannii* and *chera* are in the Arizona key, but *carmenensis* is excluded.

The keys are written for adult specimens, but the keys for females will be of some aid to identifying immatures based on markings. A key for immature *Pele-*

grina from Minnesota has been given by Cutler (1981b).

Figures 258–538 provide the most comprehensive set of illustrations of the species, but important aid can be obtained from Figures 130–189, which show living specimens, Figures 190–235, which summarize the male emboli, and Figures 236–257, which show the surface topography of the epigyna.

KEY TO THE MALES OF ALL SPECIES OF *PELEGRINA* AND THOSE *METAPHIDIPPUS MANNII* GROUP SPECIES OCCURRING IN THE UNITED STATES*

1. Erect portion of embolus extremely narrow or tapers to point, lacking two terminal rami (Figs. 226–235); lateral margin of chelicera usually with ridge near base of fang (Figs. 483, 493, 503, 509, 514, 529); at least small patch of white or orange scales on chelicerae; western United States and southwestern Canada, south into Central America (*Metaphidippus mannii* group, in part, and some *Pelegrina*) 2

– Erect portion of embolus in most species wide at tip and with two terminal rami (Figs. 190–225); chelicera lacking ridge near base of fang (e.g., Figs. 258, 264); scales on chelicerae varied; widely distributed 10

2(1). Long patch of white scales on chelicerae, longer than ½ length of chelicerae (Figs. 478, 493, 514, 529) 3

– White or orange patch small (Figs. 483, 503, 509) 7

3(2). Embolus wide at base of erect portion (Figs. 226–231) 4

– Embolus very narrow (Figs. 516–523, 535) 6

4(3). Forehead white band lacking so that setae above AMEs are dark (Figs. 493, 503); retrolateral edge of base of embolus with prolongation (Figs. 494, 499, 505) 5

– White forehead band present and contacting AMEs above (Fig. 478); retrolateral edge of base of embolus lacking prolongation (Fig. 479); central Arizona south to Oaxaca .... 37. *bunites* (part)

5(4). Carapace and abdomen shiny dark or coppery brown contrasting strongly with dense white cheek band and cheliceral patches, with small or no white side bands (Figs. 178, 180, 493); prolongation on retrolateral edge of base of embolus blunt or small (Fig. 494) where sympatric with *diplacis*; British Columbia to California east to Idaho and central Arizona .... 40. *mannii*

– Carapace and abdomen with more extensive white side bands (Figs. 182, 503); cheek band not distinct from side band (Fig. 503); prolongation of retrolateral edge of base of embolus distinct and long (Figs. 504, 505); along Pacific Coast of southern California and Baja California .... 41. *diplacis* (part)

6(3). Erect portion of embolus straight (Fig. 233); face dark under eyes (Fig. 514) .... 43. *chera*

– Erect portion of embolus curves ventrally (Fig. 234); face extensively covered with white scales (Fig. 529) except in Baja California Sur .... 44. *carmenensis*

7(2). Erect portion of embolus obliquely truncated, broad at base (Figs. 227, 484); carapace and abdomen dusted with beige to light brown scales (Figs. 172, 483); Arizona and México .... 38. *orestes* (part)

– Erect portion of embolus not so broad or truncated (Figs. 505, 510); markings dark brown with white (Figs. 182, 184, 503, 509) or mostly yellow (Fig. 176) 8

8(7). Legs yellow, first legs fringed with white (Fig. 176); anterior median eyes ringed with red; chelicerae vertical and relatively weak (Fig. 534); erect portion of embolus very thin (Fig. 535); southern California to New Mexico .... 45. *emmiltus* (part)

– Legs with dark brown markings (Figs. 182, 184, 503, 509); anterior median eyes ringed with dark setae; chelicerae at least slightly divergent; embolus thick or thin; Pacific Coast of California and Baja California 9

9(8). Embolus wide at base of erect portion (Figs. 231, 504, 505); scales on chelicerae white; body with bronze reflections (Fig. 182); prolongation on retrolateral edge of base of embolus large and distinct (Figs. 504, 505); southern California and México .... 41. *diplacis* (part)

– Embolus thin (Figs. 232, 510); scales on

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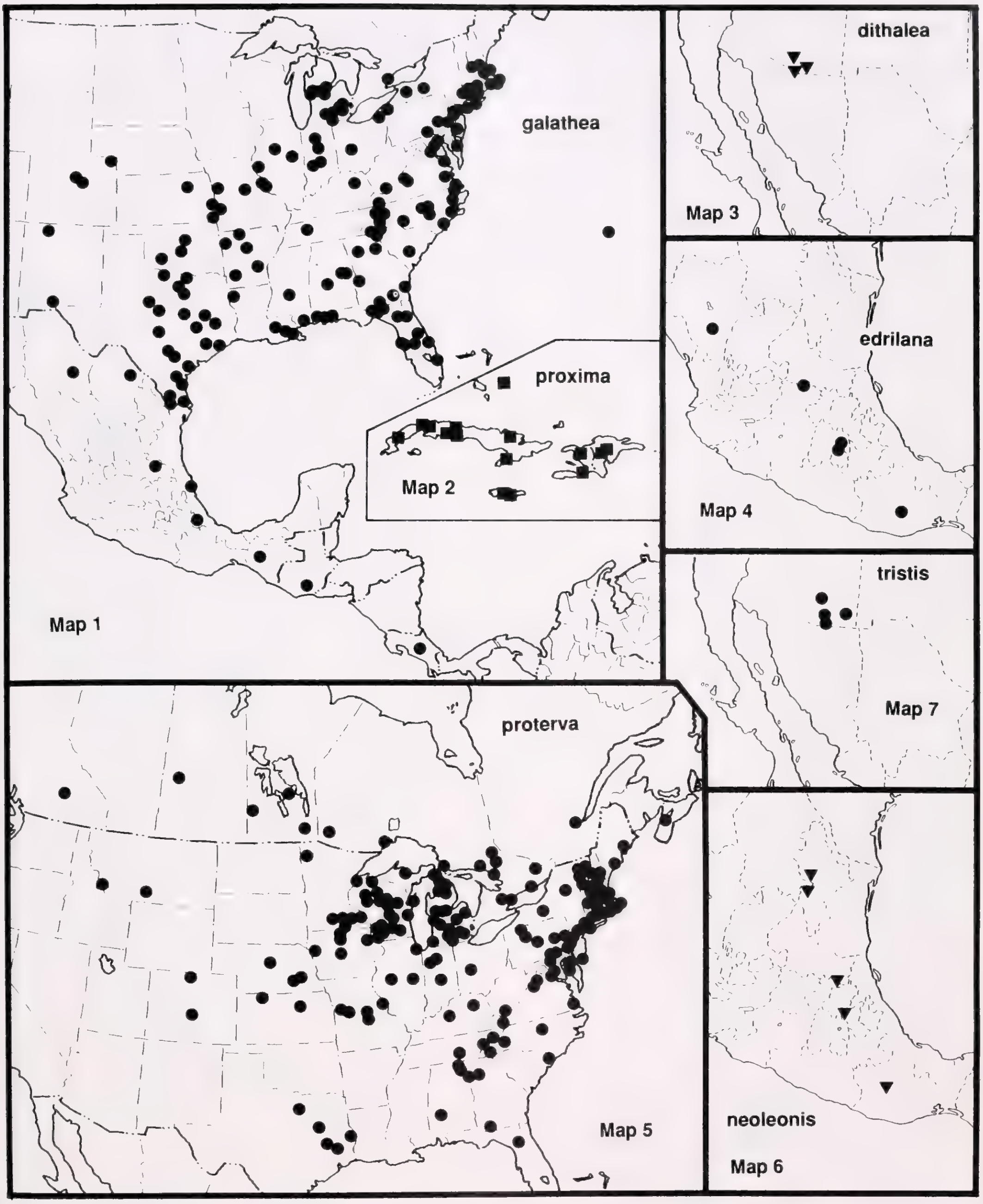
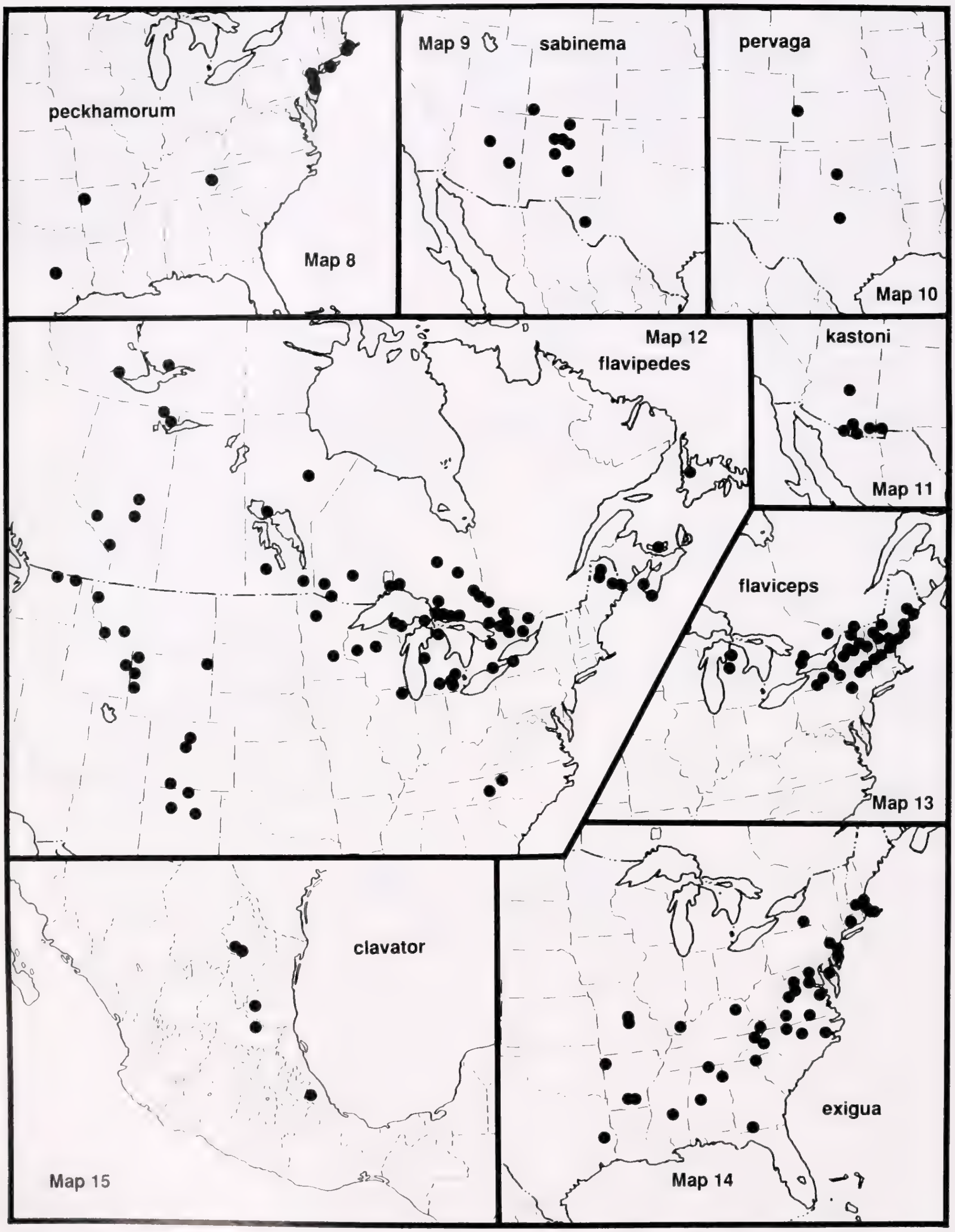
* The *mannii* group species in México and Central America are not included; they can be distinguished from *Pelegrina* by their narrower embolus tip, which lacks the two rami. *Nagaina incunda*, described later, is brown and yellow striped with the first legs brown and the posterior legs yellow (Fig. 174).


galathea
proxima
Map 2
Map 1
dithalea
Map 3
edrilana
Map 4
tristis
Map 7
proterva
Map 5
neoleonis
Map 6

Maps 1–7. Distributions of *Pelegrina* species. 1. *Pelegrina galathea* in North and Central America. 2. *P. proxima* in the Caribbean. 3. *P. dithalea* in Arizona. 4. *P. edrilana* in México. 5. *P. proterva* in North America. 6. *P. neoleonis* in México. 7. *P. tristis* in Arizona.


peckhamorum
Map 8
Map 9
sabinema
pervaga
Map 10
Map 12
flavipedes
kastoni
Map 11
flaviceps
Map 13
clavator
Map 15
exigua
Map 14

Maps 8–15. Distributions of *Pelegrina* species. 8. *P. peckhamorum* in the eastern United States. 9. *P. sabinema* in the southwestern United States. 10. *P. pervaga* in the central United States. 11. *P. kastoni* in the southwestern United States. 12. *P flavipedes* in North America. 13. *P. flaviceps* in eastern North America. 14. *P. exigua* in the eastern United States. 15. *P. clavator* in México.

chelicerae orange; body dark and dull (Fig. 184); prolongation on retrolateral edge of base of embolus small or absent (Fig. 510); central and northern California .... 42. *tricolor*

10(1). Clypeus with patch of white or yellow scales between AMEs (not merely hairs overhanging chelicerae or circling anterior median eyes) 11

– Clypeus without white or yellow setae between AMEs, except perhaps for hairs surrounding anterior median eyes and overhanging chelicerae 17

11(10). Chelicerae with large white or yellow patch of scales medially, at least for ½ length of chelicerae (Figs. 159, 437, 442, 457); México and Central America 12

– Chelicerae lacking pale scales (Figs. 282, 288, 319, 334); United States east of Rocky Mountains and Canada 14

12(11). Retrolateral ramus of embolus much longer than prolateral (Fig. 221) .... 32. *pallidata*

– Retrolateral ramus of embolus small, subequal to prolateral (Figs. 220, 224) 13

13(12). Pale markings usually yellowish; embolus small and tapers to tip (Fig. 224); lowland .... 35. *sandaracina*

– Pale markings white; embolus broadly truncate (Fig. 220); montane .... 31. *clavator* (part)

14(11). Chelicerae yellow (Figs. 319, 334); embolus deeply divided (Figs. 320, 330); cymbium lacks white scales; dwellers on conifers 15

– Chelicerae brown (Figs. 282, 288); embolus not deeply divided (Figs. 260, 266); cymbium with dorsal patch of white scales; habitat varies 16

15(14). First tibia yellow or with thin black stripe; retrolateral ramus of embolus thick, only slightly thinner than prolateral (Figs. 201, 320) .... 12. *flavipedes*

– First tibia dark; retrolateral ramus much thinner than prolateral (Figs. 203, 330) .... 14. *exigua* (part)

16(14). Embolus tapers to tip (Fig. 284), with long hooked retrolateral ramus (Fig. 283) .... 5. *proterva*

– Embolus very broad at tip (Fig. 290), retrolateral ramus short (Fig. 289) .... 6. *peckhamorum*

17(10). Chelicerae yellow (Figs. 304, 309, 314, 324, 329, 534); dwellers on conifer and spanish moss 18

– Chelicerae brown (e.g., Figs. 258, 264) 24

18(17). Medial black spot on chelicerae (Figs. 324, 329); embolus deeply divided (Figs. 325, 330); eastern and central United States and Canada 19

– No medial black spot on chelicerae (Figs. 304, 309, 314, 534); southern United States and northern México 20

19(18). Forehead flat (Fig. 329); forehead dark brown in alcohol; body and legs brown (Fig. 146); chelicerae yellow laterally (Fig. 329); southeastern United States north to Massachusetts and New York .... 14. *exigua* (part)

– Forehead bulbous (Fig. 324); forehead yellow in alcohol; body and legs pale (Fig. 144); chelicerae with dark spot laterally (Fig. 324); northeastern United States and southeastern Canada .... 13. *flaviceps*

20(18). Erect portion of embolus very thin (Fig. 535); AMEs ringed with red; first legs fringed with white (Fig. 176) .... 45. *emmiltus* (part)

– Erect portion of embolus thicker (Figs. 305, 310, 315, 474); AMEs ringed with white or brown; legs not fringed 21

21(20). Cymbium yellow; band of dark setae under carapace side band (Figs. 304, 309, 324); embolus wide at tip (Figs. 305, 310, 315); dwelling on conifer; Kansas west to Arizona 22

– Cymbium dark distally; no band of dark setae under carapace side band (Fig. 472); embolus tapers to narrow tip (Fig. 474); dwelling on spanish moss, Florida and North Carolina west to Texas .... 36. *tillandsiae* (part)

22(21). Clypeus brown (Figs. 304, 309); retrolateral ramus of embolus long (Figs. 198, 199, 305, 310); embolus broad at base of erect portion 23

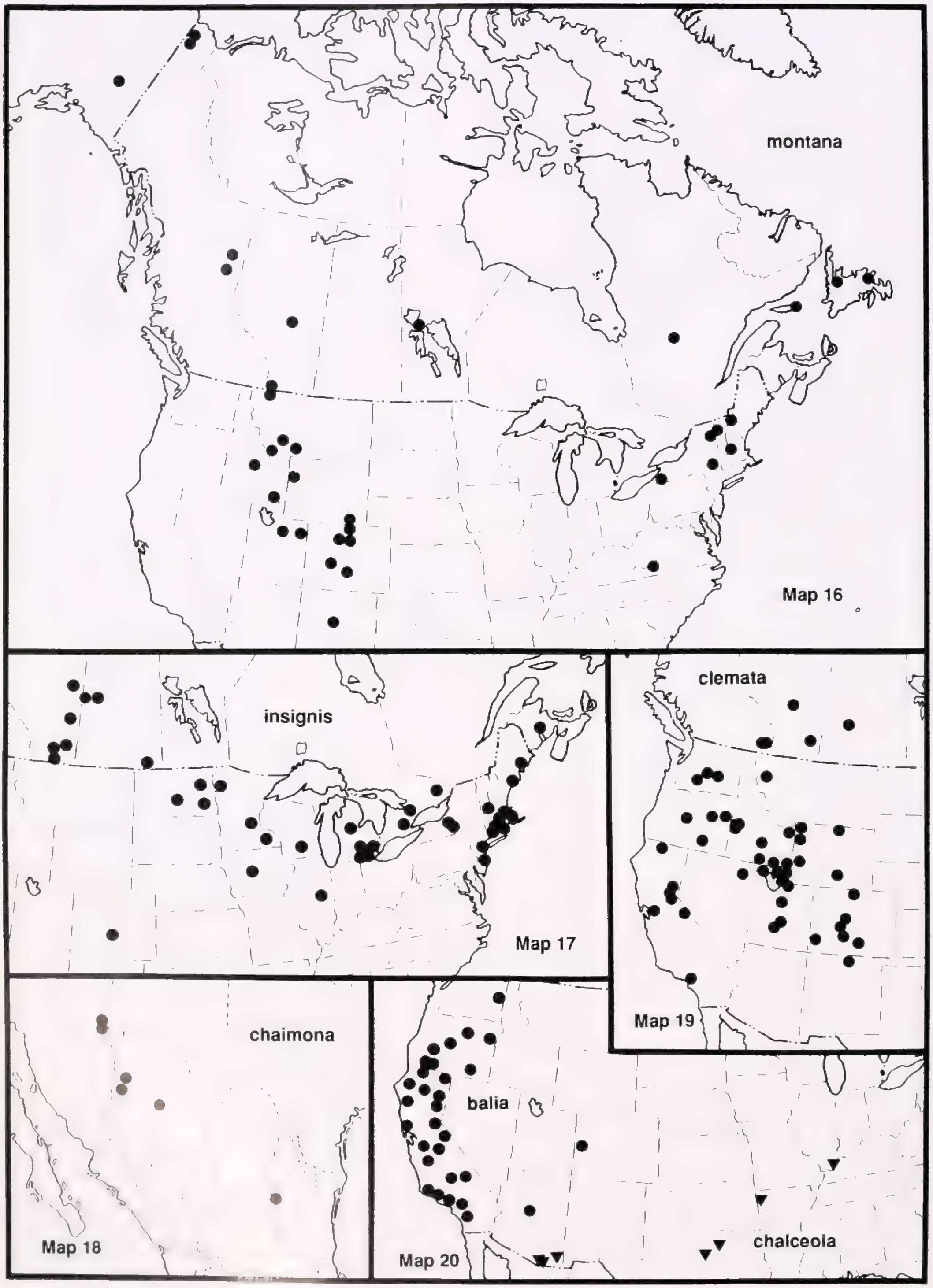
– Clypeus with white band except centrally (Fig. 314); retrolateral ramus of embolus short (Fig. 200); embolus rectangular, narrow, and displaced retrolaterally (Fig. 315) .... 11. *kastoni*

23(22). Abdomen brown above; embolus (Fig. 305) wider than in *pervaga* 9. *sabinema*

– Abdomen with central longitudinal pale stripe as in females (Fig. 313); embolus (Fig. 310) narrower than *sabinema* .... 10. *pervaga*

24(17). Ridge under tibial apophysis usually developed into acute second apophysis (Fig. 389); wrinkles on embolic base transverse or ascending apically toward the retrolateral edge (Figs. 390, 404, 406, 411, 416); southwestern United States to Panamá (*furcata* group) 25

– At most small ridge or broad flange under tibial apophysis (Figs. 78, 421, 427); wrinkles on embolic base descending basally toward the retrolateral edge


montana
Map 16
insignis
Map 17
clemata
Map 19
chaimona
Map 18
balia
chalceola
Map 20

(e.g., Figs. 315, 438); widely distributed 29

25(24). Rami of embolus small and subequal (Figs. 213, 214) 26

– Retrolateral ramus of embolus long, much longer than prolateral (Figs. 212, 215, 216) 27

26(25). White patches on chelicerae extend to at least ½ their length (Fig. 403); embolus more or less straight (Figs. 213, 404); Panamá .... 23. *volcana*

– White patches on chelicerae small (Fig. 405); embolus bent to retrolateral (Figs. 214, 406); Guatemala and México .... 24. *bicuspidata*

27(25). Retrolateral ramus curls to prolateral (Figs. 215, 411) .... 26. *morelos*

– Retrolateral ramus points retrolaterally or distally (Figs. 212, 216, 390–394, 416) 28

28(27). Retrolateral ramus points more distally, about twice as long as prolateral ramus (Figs. 212, 390–394); widely distributed .... 22. *furcata* (part)

– Retrolateral ramus points more retrolaterally, more than four times longer than prolateral ramus (Figs. 216, 416); southern Arizona .... 27. *huachuca*

29(24). Large white patches on chelicerae at least to ½ their length (Figs. 437, 447, 452, 478); embolus twists to tip; Arizona, México, and Central America 30

– Chelicerae with at most a small medial-basal patch of scales (e.g., Figs. 258, 348); embolus varied; widely distributed geographically 33

30(29). Embolus broad and truncated (Figs. 220, 438); dorsum of abdomen mostly brown between side bands (Fig. 164); montane .... 31. *clavator* (part)

– Embolus narrower, tapers to tip; dorsum of abdomen may have large white spots (Fig. 166); varied habitats 31

31(30). Embolus tapers to narrow tip with terminal opening (Fig. 226); abdominal dorsum brown between white side bands (Fig. 170); montane habitats .... 37. *bunites* (part)

– Embolus tip wider, opening subterminal (Figs. 223, 224); abdominal dorsum with mixed pale and dark spots (Fig. 166) as in female; deserts and tropical lowlands 32

32(31). Side and cheek bands fused (Fig. 447); chelicerae robust; embolus appears to taper in ventral view but in an oblique view the two small subequal rami are easily seen (Fig. 222); abdomen with strong white spots (Fig. 166); arid regions of México and Central America .... 33. *variegata* (part)

– Side and cheek bands separate (Fig. 452); chelicerae narrower; embolus weaker with two rami not easily visible; abdomen with unusual transverse bands (Fig. 169); seasonal tropical forests of Yucatán Peninsula .... 34. *yucatecana*

33(29). Embolus with long retrolateral ramus (e.g., Figs. 196, 197, 209); western United States and México 34

– Embolus with short retrolateral ramus (e.g., Figs. 190, 206, 210), or rami not distinct (e.g., Figs. 219, 225); widely distributed 38

34(33). Retrolateral ramus curled prolaterally (Figs. 196, 197); embolus very broad at base 35

– Retrolateral ramus erect or pointing prolaterally (Figs. 193, 209, 212); embolus narrower at base 36

35(34). Prolateral ramus of embolus obtuse (Figs. 196, 259); retrolateral ramus blunt and with bump (Fig. 295); embolus narrower at base than in *tritis* (Fig. 196); México .... 8. *neoleonis*

– Prolateral ramus acute (Figs. 197, 300); retrolateral ramus sharp; embolus broader at base (Fig. 197); Arizona .... 7. *tristis*

36(34). Side and forehead bands on carapace reduced or absent (Figs. 156, 365); western United States and Canada .... 19. *aeneola* (part)

– Side and forehead bands on carapace well developed (Figs. 158, 276, 388); southwestern United States, México, and Central America 37

37(36). Retrolateral ramus of embolus longer and diverging from prolateral (Fig. 212); widely distributed .... 22. *furcata* (part)

– Retrolateral ramus of embolus vertical (Fig. 193); embolus narrows abruptly near tip; central México .... 4. *edrilana* (part)

38(33). Erect portion of embolus arises on retrolateral side (Figs. 422, 428); flange under tibial apophysis (Figs. 421, 427; *arizonensis* group) 39

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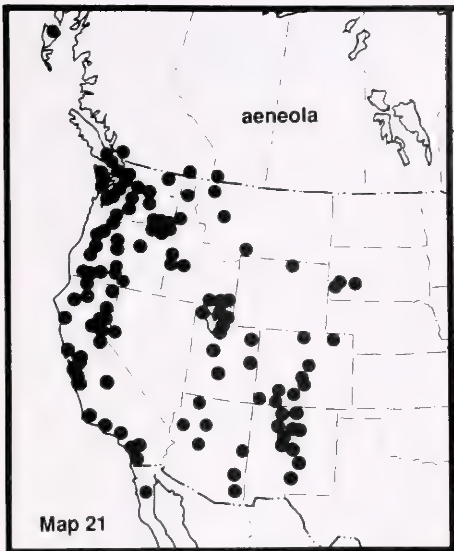
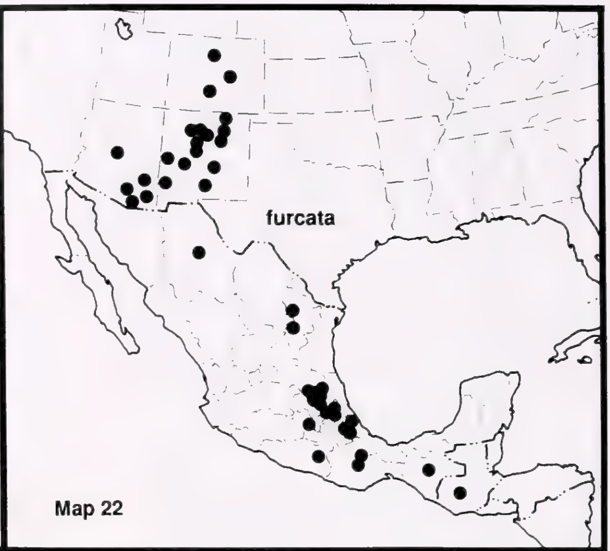
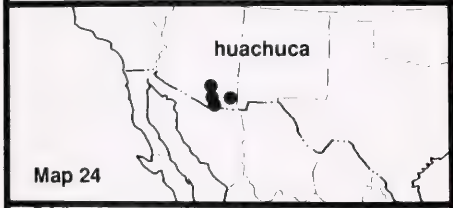
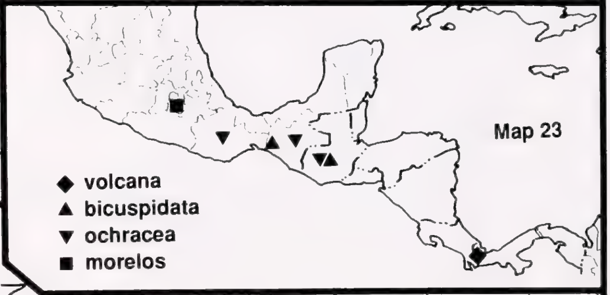
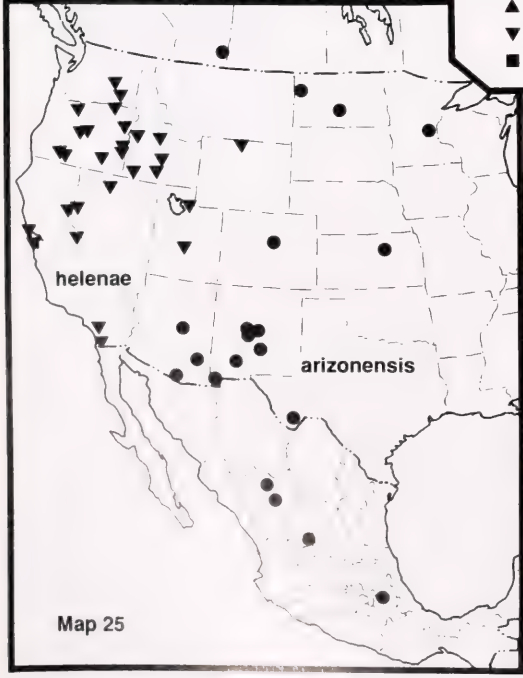
Maps 16–20. Distributions of *Pelegrina* species. 16. *P. montana* in North America. 17. *P. insignis* in North America. 18. *P. chaimona* in México and Arizona. 19. *P. clemata* in western North America. 20. *P. balia* and *P. chalceola* in western North America.

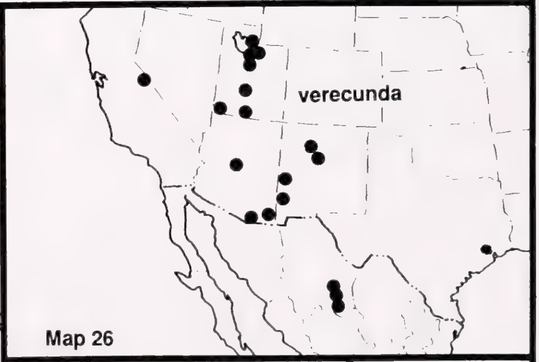

aeneola
Map 21

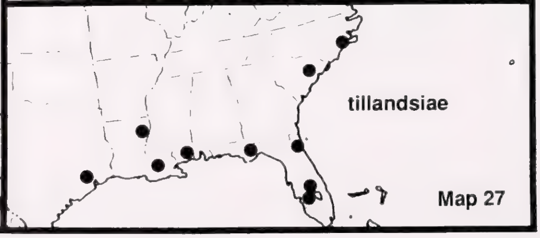

furcata
Map 22


huachuca
Map 24


Map 23
◆ volcana
▲ bicuspidata
▼ ochracea
■ morelos


helenae
arizonensis
Map 25


verecunda
Map 26


tillandsiae
Map 27

– Erect portion of embolus arises centrally; ridge under tibial apophysis not developed into flange (Fig. 78) 40

39(38). Embolus tip sharp (Fig. 422); tibial, apophysis flange broad and short (Fig. 421) .... 28. *arizonensis*

– Embolus tip blunt (Fig. 428); tibial apophysis flange narrow and elongate (Fig. 427) .... 29. *helenae*

40(38). Chelicerae lacking pale scales 41

– Chelicerae with small patch of white or yellow scales 46

41(40). Embolus narrows abruptly just basal to opening (Fig. 190); retrolateral ramus is small hook (Fig. 259); southern Ontario, eastern United States south to Central America .... 1. *galathea*

– Embolus parallel-sided or widens near tip; retrolateral ramus is small angle or apparently absent; Canada and mountainous areas of United States 42

42(41). Retrolateral ramus of embolus longer than prolateral and leaning retrolaterally (Figs. 208, 209); forehead band absent .... 19. *aeneola* (part)

– Both rami of embolus small; forehead band present or absent 43

43(42). Embolus swollen near tip (Figs. 204, 344) .... 15. *montana*

– Embolus with sides parallel or slightly tapering near tip (Figs. 207, 210, 211) 44

44(43). Forehead band well developed and contacting AMEs (Figs. 152, 359); tegulum with prominent prolateral bump (Fig. 361) .... 18. *clemata* (part)

– Forehead band absent or if present then not contacting AMEs (Figs. 378, 383); tegulum with at most small prolateral bump (Figs. 379, 384) 45

45(44). Cheliceral fang with flange (Fig. 378); carapace side bands broad (Fig. 378), embolus bends slightly (Figs. 210, 379); California and northern Arizona north to Washington .... 20. *balia*

– Cheliceral fang lacking flange (Fig. 383); side bands narrower (Fig. 383); embolus straight (Figs. 207, 211); southern Arizona to southern Illinois .... 21. *chalceola*

46(40). Abdomen with striking lineate markings as in female (Fig. 477); embolus tapering to sharp tip in ventral view; living on Spanish moss .... 36. *tillandsiae* (part)

– Abdomen brown or spotted above; embolus usually broad at tip though varies; habitat varied 47

47(46). Erect portion of embolus very thin (Fig. 535); anterior median eyes ringed with red; first legs yellow fringed with white (Fig. 176) .... 45. *emmiltus* (part)

– Erect portion of embolus thicker; eyes ringed with white or brown; legs not fringed 48

48(47). Abdomen with paired black spots on brown dorsum; pale markings yellowish; embolus long and rectangular, leaning slightly retrolaterally (Figs. 205, 349, 350) truncate at tip and with retrolateral ramus apparently absent (Fig. 205); Canada and northeastern United States .... 16. *insignis*

– Abdomen lacking distinct black spots; pale markings white or yellowish; embolus shorter (Fig. 219) or if long, then straight and with more prominent rami (e.g., Figs. 192, 206, 207, 222) 49

49(48). Abdomen with large and distinct paired white spots as in female (Fig. 166); side and cheek bands fused (Fig. 447); chelicerae robust (Fig. 447); erect portion of embolus parallel-sided and with two subequal rami (Fig. 222); deserts of México and Central America .... 33. *variegata* (part)

– Abdomen with only small (Figs. 130, 132, 152) or indistinct (Figs. 162, 172) paired pale spots, side and cheek bands separate; chelicerae not so robust; embolus varied 50

50(49). Side bands of carapace and abdomen weak or absent and abdomen mottled (Figs. 162, 172); embolus small, lacking two distinct rami (Figs. 219, 227) 51

– Side bands well developed and abdomen not mottled (Figs. 130, 132, 152) 52

51(50). Pale markings white or gray; erect portion of embolus widens gradually on prolateral lside as it contacts basal portion (Fig. 433); tip of embolus rounded (Fig. 219) .... 30. *verecunda*

– Pale markings orange or tan; erect portion of embolus widens abruptly on prolateral side as it contacts basal por-

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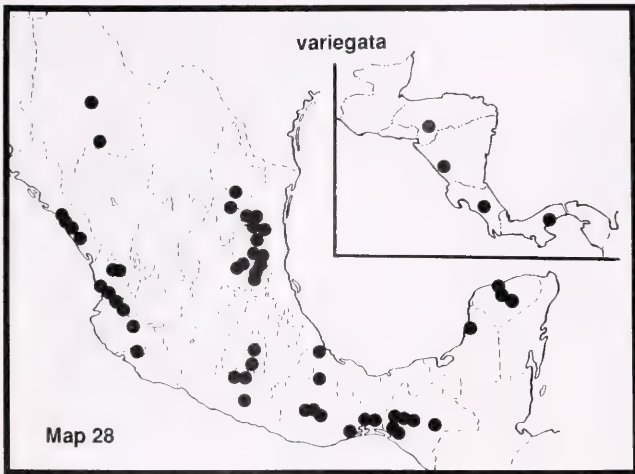
Maps 21–27. Distributions of *Pelegrina* species. 21. *P. aeneola* in western North America. 22. *P. furcata* in México and the southwestern United States. 23. *P. furcata* group members in México and Central America. 24. *P. huachuca* in Arizona. 25. *P. arizonensis* and *P. helenae* in western North America (see Cutler and Jennings, 1985, for additional records). 26. *P. verecunda* in western North America. 27. *P. tillandsiae* in southeastern North America.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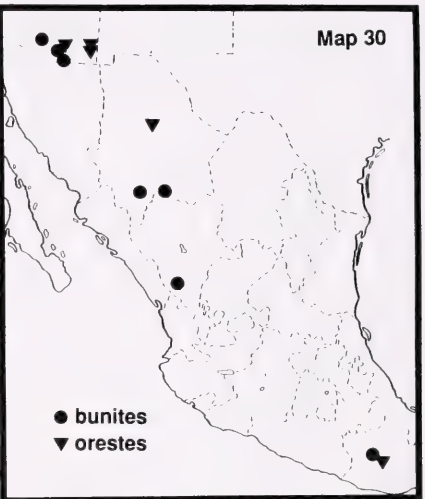
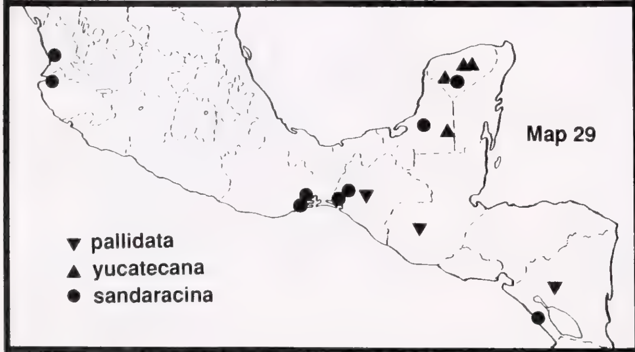
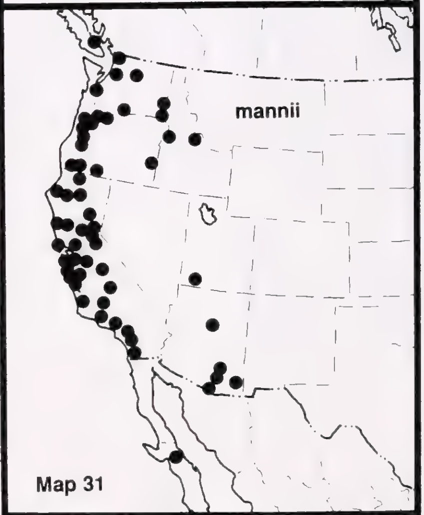

Map 30
● bunites
▼ orestes


Map 29
▼ pallidata
▲ yucatecana
● sandaracina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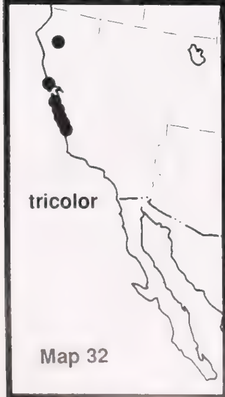
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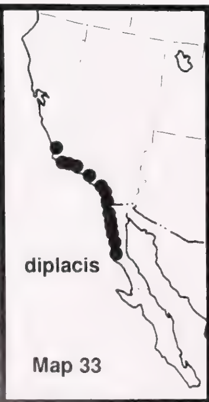
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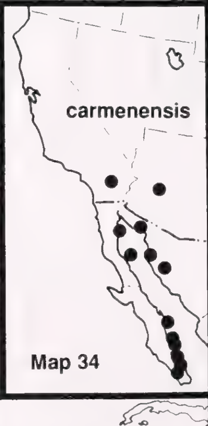
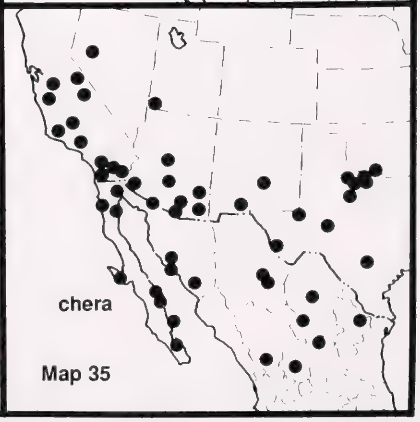

Map 34
carmenensis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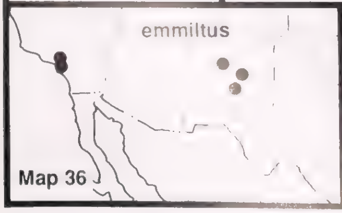
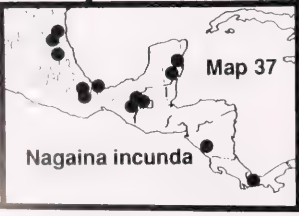

Map 36


Map 37
Nagaina incunda

tion so as to make a distinct corner (Fig. 484); tip of embolus pointed retrolateral to opening (Fig. 227) ... 38. *orestes* (part)

52(50). Retrolateral ramus longer than prolateral (Figs. 190, 193) ... 53

– Rami subequal (Figs. 191, 192, 206, 207) 54

53(52). Embolus sides parallel below opening (Fig. 190); retrolateral ramus narrow (Fig. 259); widespread ... 1. *galathea* (part)

– Embolus inflated below opening (Fig. 193); retrolateral ramus wide (Fig. 277); central México ... 4. *edrilana* (part)

54(52). Abdomen with two central broken longitudinal pale stripes in addition to side bands as in female (Fig. 269); Caribbean ... 2. *proxima*

– Abdomen lacking central longitudinal bands; western North America ... 55

55(54). Embolus parallel-sided or tapers slightly to tip (Figs. 207, 360, 361); basal to opening the prolateral side is straight (Fig. 207); sagebrush of western Untied States and Canada ... 18. *clemata* (part)

– Embolus widens slightly near tip (Figs. 192, 206); just basal to opening on prolateral side is angle (Figs. 192, 206); Arizona and México ... 56

56(55). Rami of embolus well separated (Fig. 192); side bands have extensions joining between posterior eyes (Fig. 132); no denticles on exposed surface of embolus (Fig. 192) ... 3. *dithalea*

– Rami close together (Fig. 206); side bands without extensions; surface of embolus with denticles (Fig. 206) ... 17. *chaimona*

KEY TO THE FEMALE *PELEGRINA* OF THE EASTERN UNITED STATES AND CANADA (EAST OF THE MISSISSIPPI RIVER AND MANITOBA)

1. Posterior margin of epigynal flap truncated so as to be transverse, and standing high over surface behind it (Figs. 236, 262); epigynal flaps convex, parallel; legs distinctly annulate (Fig. 131); abdomen marked with four pairs of prominent white spots with small black spots behind them (Figs. 131, 263) ... 1. *galathea*

– Posterior margin of epigynal flap rounded, not transverse, or if transverse then flaps flat and flush with surface behind them (Figs. 238, 239, 241–245, 254); legs not distinctly annulate; abdomen with white spots smaller, often thinner and elongate (e.g., Figs. 287, 323, 353) ... 2

2(1). Abdomen with prominent paired black spots on orange-brown background (Figs. 161, 353); epigynal flaps divergent (Fig. 352); epigynal surface rises dramatically from low area around flaps to high posterior margin (Fig. 245); legs and face yellowish; mostly northern ... 16. *insignis*

– Abdomen lacking prominent paired black spots though may have brown or reddish patches; epigynal flaps parallel, convergent, or divergent; epigynal surface in most species with little relief (e.g., Figs. 238, 241); legs and face varied; locality varied ... 3

3(2). Epigynum with ridge just behind each flap (Figs. 244, 346); posterior notch often rectangular; body large and dark with very small paired white spots on dark abdominal dorsum (Fig. 347); Canada and mountains of United States ... 15. *montana*

– Epigynum lacking ridges behind flaps; posterior notch triangular; body smaller; abdomen varied ... 4

4(3). Abdomen strongly striped longitudinally yellow and brown (Fig. 477); epigynal flaps pale; living on spanish moss of the southeastern United States ... 36. *tillandsiae*

– Abdomen not striped yellow and brown longitudinally, usually spotted; epigynal flaps varied ... 5

5(4). Epigynal surface and flaps very flat (Figs. 241–243); flaps not much darker than rest of epigynum except for narrow rim (Figs. 322, 327, 332); carapace often with shiny scales and pale spot above and between anterior median eyes (e.g., Fig. 143); conifer dwellers (*flavipedes* group) ... 6

– Epigynal surface and flaps with more relief (Figs. 237, 238); flaps usually distinctly darker than rest of epigynum (Figs. 286, 292); carapace lacking shiny scales ... 8

6(5). Forehead dark above and between AMEs; head often bulbous; legs pale yellow, usually with thin longitudinal dark lines on

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Maps 28–37. Distributions of species of *Pelegrina*, the *Metaphidippus mannii* species group, and *Nagaina incunda*. 28. *P. variegata* in México and Central America. 29. *P. pallidata*, *P. yucetecana*, and *P. sandaracina* in México and Central America. 30. *P. bunites* and *P. orestes* in Arizona and western México. 31. *M. mannii* in western North America. 32. *M. tricolor* in California. 33. *M. diplacis* in California and Baja California. 34. *M. carmenensis* in México and the southwestern United States. 35. *M. chera* in México and the southwestern United States. 36. *P. emmiltus* in California and New Mexico. 37. *Nagaina incunda* in México and Central America.

femora; epigynum with second curve of spermathecal duct wider than in *flavipedes* but no so wide as in *exigua* (Figs. 340, 341); northeastern United States bordering Canada and southeastern Canada .... 13. *flaviceps*

– Forehead with pale spot above and between anterior median eyes; head not bulbous; legs generally lacking longitudinal lines or if persent then wide and mostly on anterior legs; epigynum otherwise; distribution generally farther north or farther south than *flaviceps* 7

7(6). Epigynal flaps parallel (Figs. 241, 322); second curve of spermathecal duct narrow and oblique (Figs. 321, 338, 339); carapace narrow; mostly northern (Canada and northern United States) though found occasionally on southern mountains .... 12. *flavipedes*

– Epigynal flaps convergent (Figs. 243, 332); second curve of spermathecal duct very broad and transverse (Figs. 331, 336, 337) carapace broader; mostly southern United States north to Massachusetts and New York .... 14. *exigua*

8(5). Abdomen marked with large square brown spots on or between paired pale spots (Figs. 2, 135, 287); epigynal flaps convergent and fairly flat, short (Figs. 238, 286); surface rises quickly behind flaps to broad mound (Fig. 238) .... 5. *proterva*

– Abdomen uniformly light brown with small white spots (Figs. 137, 293); epigynal flaps long and fairly convex (Figs. 239, 292); surface rises gradually behind flaps to mound at posterior (Fig. 239) .... 6. *peckhamorum*

KEY TO THE FEMALE *PELEGRINA* OF THE GREAT PLAINS (BETWEEN THE ROCKY MOUNTAINS AND THE MISSISSIPPI RIVER)*

1. Epigynal flaps rotated 180° (Fig. 424); abdomen with strongly lineate markings (Fig. 425) .... 28. *arizonensis*

– Epigynal flaps rotated at most 45°; abdominal markings not so clearly lineate 2

2(1). Legs distinctly annulate, and abdomen marked with four pairs of prominent white spots with small black spots behind them (Figs. 131, 263); epigynal flaps convex, parallel, posterior margin truncated so as to be transverse and standing high over surface (Figs. 236, 262) .... 1. *galathea*

– Legs not distinctly annulate; abdomen with more prominent dark areas on either side of smaller pale spots (though *pervaga* with pale spots coalesced into single large spot); epigynal flaps varied, but posterior margin not truncated 3

3(2). Area behind epigynal flaps raised into high mound (Figs. 245, 246); carapace densely covered with white or yellow scales (Figs. 153, 161) 4

– Area behind epigynal flaps more or less flat (Figs. 238, 240); carapace thinly covered with pale scales (e.g., Fig. 135) 5

4(3). Scales on carapace white; legs beige and brown; abdomen with large dark patches on either side of central paired spots but lacking strong black spots (Fig. 364), anteriormost pale spots fused into short longitudinal bands; epigynal surface behind flaps raised into broad dark shiny round mound (Fig. 246); flaps convergent (Figs. 246, 363); usually collected from sagebrush .... 18. *clemata*

– Scales on carapace yellowish; legs yellow; abdomen with paired black spots (Fig. 353); epigynal surface behind flaps raised gradually but steeply into high mound along posterior of epigynum (Fig. 245); flaps divergent (Figs. 245, 352); low herbs in fields and bogs .... 16. *insignis*

5(3). Abdomen marked with large square brown spots between small paired pale bands (Figs. 135, 287); epigynal flaps convergent and fairly flat, short and dark (Figs. 238, 286); surface rises quickly behind flaps to broad mound (Fig. 238); carapace narrow; widespread .... (5) *proterva*

– Abdomen with large central pale spot (Fig. 313); epigynal flaps large and flat, fairly pale (Figs. 240, 312); carapace very wide; Kansas to Texas .... 10. *pervaga*

KEY TO THE FEMALE *PELEGRINA* OF THE PACIFIC COAST OF THE UNITED STATES AND WESTERN CANADA*

1. Epigynal flaps rotated 270° so that flaps are transverse (Fig. 430); abdomen with lineate markings (Figs. 155, 431); commonly found on sagebrush .... 29. *helenae*

– Epigynal flaps rotated less than 45°; abdomen with markings not lineate except occasinally in *clemata*; habitat varied 2

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* Not included are some tree-dwelling species whose ranges reach into the Great Plains: *Pelegrina flavipedes* and *exigua*, which occur on conifers in the north and east; *P. peckhamorum*, on oaks in the southeast; and *chalceola*, in Texas to extreme southern Illinois.

* Includes California, Nevada, Oregon, Washington, Idaho, British Columbia, and Alberta. Included is *Metaphidippus mannii*, as well, but not the other *mannii* group species, which are restricted to the southern part of the area of the key. Not included is *P. verecunda* (see Arizona key).

2(1). Epigynal surface and flaps very flat (Figs. 241, 256); body with shiny bronze or copper scales (Figs. 143, 179) 3

– Epigynal flaps more convex and epigynal surface with more relief (Figs. 238, 244–248); flaps usually distinctly darker than rest of epigynum; body usually without metallic sheen; habitat varied 4

3(2). Orange scales between and beside AMEs just above clypeus; body fairly smooth with shiny coppery scales (Fig. 179); usually on oaks, holly, *Arctostaphylos*, and other shrubs and trees with leathery leaves ...... 40. *mannii*

– White or dark scales around eyes; carapace often with pale spot above and between AMEs (e.g., Fig. 143); body with rougher appearance; on conifers ...... 12. *flavipedes*

4(2). Epigynal flap angled where flap bends down toward opening (Figs. 247, 374, 376); surface rises immediately behind flap to broad plateau covering posterior of epigynum (Fig. 247); carapace thinly covered with white scales that often form an inverted T behind the AMEs (Fig. 157); abdomen often with anterior medial paired spots coalesced into one large white spot (Figs. 157, 377); common on various plants including conifers ...... 19. *aeneola*

– Epigynal flaps not angled; surface of epigynum varied; carapace lacking T-shaped marking on head; abdomen with anterior medial paired spots separate (Figs. 347, 364, 382); habitat varied 5

5(4). Scales on carapace yellowish; legs yellow; abdomen with paired black spots (Fig. 353); epigynal surface behind flaps raised gradually but steeply into high mound along posterior of epigynum (Fig. 245); flaps divergent (Figs. 245, 352); low herbs in fields and bogs ...... 16. *insignis*

– Scales on carapace white, beige, or tan; epigynal surface behind flaps either more or less flat (Figs. 244, 248) or raised quickly behind flaps into mound (Figs. 238, 246); habitat varied 6

6(5). Area behind epigynal flaps raised into a broad mound (Figs. 238, 246); flaps convergent; carapace with whitish scales 7

– Area behind flaps more nearly flat or concave (Figs. 244, 248); flaps divergent or convergent; carapace dark or covered with yellowish scales 8

7(6). Area behind epigynal flaps strongly raised into round dark shiny mound (Figs. 246, 363); flaps convergent; carapace densely covered with white scales (Fig. 153); abdomen with large dark patches on either side of central paired spots (Fig. 364), anteriormost pale spots fused into short longitudinal bands; commonly found on sagebrush ...... 18. *clemata*

– Area behind flaps only moderately raised into broad mound (Fig. 238); carapace not densely covered with white; abdomen marked with large square brown spots between paired pale spots (Figs. 2, 135, 287); found on various shrubs and trees ...... 5. *proterva*

8(6). Body dark, with very small pale spots on abdomen (Fig. 347); white scales between AMEs; epigynum dark; surface rising immediately behind flap to ridge (Fig. 244); collected from waterside shrubs and trees ...... 15. *montana*

– Body mottled beige and tan, with large yellowish spots on abdomen (Fig. 382), orange scales between AMEs; epigynum pale; surface rising gradually behind flaps (Fig. 248); juniper-dwelling ...... 20. *balia*

KEY TO THE FEMALE *PELEGRINA* AND *MANNII* GROUP OF ARIZONA*

1. Epigynal flaps thin and rotated 90°, lying in cavity (Fig. 317); markings gold and beige; junipers of southern mountains ...... 11. *kastoni*

– Epigynal flaps rotated less than 60° (or, if rotated 90°, rarely in *tristis*, then flaps very broad); markings varied 2

2(1). Epigynal flaps broad and flat (Figs. 302, 307); epigynal surface more or less flat 3

– Epigynal flaps narrower; epigynal surface varied 4

3(2). Anterior end of epigynal opening deep, with the surface there pale and descending deeply under flap; flaps dark brown; southern Arizona ...... 7. *tristis*

– Anterior end of epigynal opening shallow, with the surface not so shallow nor descending so deeply as in *tristis*; flaps usually light brown; northern Arizona and New Mexico ...... 9. *sabinema*

4(2). Epigynal surface flat or convex behind flaps (Figs. 247, 252, 255–257); flaps often flat 5

– Epigynal surface concave behind flaps (Figs. 248–250); flaps convex 14

5(4). Epigynal flaps narrow and flat (Fig. 257), often transparent and difficult to see

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* Not included in the key are northern species that may occur in Arizona but have been at most rarely collected there: *Pelegrina montana*, *flavipedes*, *insignis*, and *clemata*. *Metaphidippus carmenensis* is a species similar to *chera* with one known specimen from Arizona. It is not included in the key.

(Figs. 525, 526); flaps divergent; common in desert vegetation though occurs at higher elevations .... 43. *chera*

– Epigynal flaps wider and more pigmented, usually more robust than in *chera*; flaps parallel, convergent or divergent; generally found in oak-conifer habitats above 1,200 m elevation 6

6(5). Epigynal flaps narrow, flat and mostly parallel except for sharp bend inward near posterior end (Figs. 255, 481); body yellow, sometimes with paired dark spots on abdomen almost as in *insignis* (Fig. 171) .... 37. *bunites*

– Epigynal flaps without sharp posterior bend; if abdomen yellow then lacking large paired dark spots 7

7(6). Abdomen very pale, yellowish, with markings consisting of little more than small dark speckles (Figs. 436, 487, 502) 8

– Abdomen more darkly marked with brown or gray (Figs. 275, 358, 377, 387) 10

8(7). Epigynal flaps divergent and narrow (Fig. 501) .... 40. *mannii* (part)

– Epigynal flaps parallel or convergent (Figs. 435, 486) 9

9(8). Epigynal flaps pale (Fig. 486) .... 38. *orestes*

– Epigynal flaps small and dark (Fig. 435) .... 30. *verecunda*

10(7). Epigynal flap angled about midway along its length where flap bends down toward opening (Fig. 247); surface rises immediately behind flap to broad plateau covering posterior of epigynum (Fig. 247); carapace thinly covered with white scales that often form an inverted T behind the AMEs (Fig. 157); abdomen often with anterior medial paired spots coalesced into one large white spot (Fig. 157) .... 19. *aeneola*

– Epigynal flaps not angled so abruptly in middle; epigynal surface varied; carapace lacking T-shaped marking on head; abdomen with paired spots separate 11

11(10). Epigynal flaps divergent and narrow (Fig. 501) .... 40. *mannii* (part)

– Epigynal flaps parallel or convergent, not so narrow (Figs. 274, 357, 386) 12

12(11). Abdomen marked much as in *galathea*, with four pairs of prominent white spots with small black spots behind them (Figs. 133, 275); epigynal flaps short, fairly flat, and parallel (Fig. 274) .... 3. *dithalea*

– Abdomen dark areas more prominent than paired white spots (Figs. 358, 387); epigynal flaps varied 13

13(12). Carapace covered with reflective scales; abdomen brown with large paired darker brown spots (Fig. 387), setae around AMEs darkest dorsally .... 21. *chalceola* (part)

– Carapace covered with white scales; abdomen with pale longitudinal side bands enclosing brown dorsum with paired white spots (Fig. 358), setae around AMEs all white .... 17. *chaimona* (part)

14(4). Epigynal flaps dark, long, narrow, and convex (Fig. 418); epigynal surface with strong relief consisting of raised bumps just medial to each flap, a concavity behind flaps rising to posterior edge (Fig. 418); first curve of epigynal ducts broad and long (Fig. 417) .... 27. *huachuca*

– Epigynal flaps not so long, nor is epigynal surface so strongly sculptured; first curve of ducts narrower 15

15(14). Epigynal flaps strongly convex (Figs. 249, 250); posterior end rounded and standing high above surface (Figs. 249, 250); second curve of duct broad (Figs. 397, 400) .... 22. *furcata*

– Epigynal flaps less convex (Figs. 248, 357, 381, 386); posterior end not standing high above surface (Fig. 248); second curve of duct narrower (Figs. 356, 380, 385) 16

16(15). Abdomen marked with large round white spots (Fig. 382); carapace wide; epigynal flaps narrow and pale (Fig. 381) .... 20. *balia*

– Abdomen with small white spots if any (Figs. 358, 387); carapace varied; epigynal flaps broader and shorter (Figs. 357, 386) 17

17(16). Carapace covered with brown reflective scales; abdomen brown with large paired darker brown spots (Fig. 387); setae around anterior median eyes darkest dorsally .... 21. *chalceola* (part)

– Carapace covered with white scales, abdomen with pale longitudinal side bands enclosing brown dorsum with paired white spots (Fig. 358); setae around anterior median eyes all white .... 17. *chaimona* (part)

KEY TO THE *PELEGRINA* AND *NAGAINA* FEMALES OF MEXICO AND CENTRAL AMERICA*

1. Body and legs mostly yellow (Fig. 163, 173, 175, 436, 461, 487, 492), with small

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* Females of the *Metaphidippus mannii* groups are not included. These can usually be distinguished from *Pelegrina* females by their weaker epigynal flaps, which descend into the openings posteriorly.

dark markings if any; epigynum and flaps mostly flat (Figs. 252, 253, 255) 2

– Body and legs well marked with brown and gray (e.g., Figs. 298, 318, 409, 414, 425); epigynal surface flat or more or less concave (e.g., Fig. 250) 9

2(1). First femur, patella, and/or tibia with small subterminal dark transverse bar (e.g., Peckham and Peckham, 1896: fig. 10); clypeus covered with yellow scales except for barren patch beneath AMEs, beneath which on chelicera is dark line; epigynal flaps weak (Fig. 491); disturbed lowland habitats .... 39. *Nagaina incunda*

– Legs uniform in color or if annulate, with dark annulae more extensive; clypeus densely covered with pale scales even below AMEs; habitat varied 3

3(2). Epigynal surface more or less flat except for longitudinal ridge between flaps (Fig. 253); flaps convergent, narrow, only slightly convex (Figs. 253, 450) .... 33. *variegata* (part)

– Epigynal surface lacking central ridge (Figs. 252, 255); flaps varied 4

4(3). Body and legs uniformly orange-yellow except sometimes for discrete small dark spots on abdomen; epigynum transparent so that spermathecae easily visible without dissection (Figs. 460, 463); flaps convergent; southern México and Central America .... 35. *sandaracina*

– Body and legs pale yellowish beige, not so orange; epigynum varied 5

5(4). Abdomen uniformly yellowish, with small discrete dark speckles only (Figs. 436, 487) 6

– Abdomen mostly yellow but any dark markings are larger spots and patches (e.g., Figs. 171, 409, 446) 7

6(5). Epigynal flaps pale, transparent (Fig. 486), convergent .... 38. *orestes*

– Epigynal flaps dark (Fig. 435), convergent to divergent .... 30. *verecunda*

7(5). Epigynal flaps strongly convex (Fig. 408); epigynum concave behind flaps .... 25. *ochracea*

– Epigynal flaps flat (Figs. 255, 482, 445); epigynal surface more or less flat 8

8(7). Epigynal flaps narrow, with abrupt bend near posterior end (Figs. 255, 481); Arizona to Oaxaca .... 37. *bunites* (part)

– Epigynal flaps wider, convergent, but without abrupt bend (Fig. 445); Chiapas to Nicaragua .... 32. *pallidata* (part)

9(1). Epigynal flaps rotated 180° (Fig. 424); abdomen with strong lineate markings (Fig. 425) .... 28. *arizonensis*

– Epigynal flaps rotated at most 90°; abdominal markings not so clearly lineate 10

10(9). Epigynal flaps dark, wide, flat, and strongly convergent (Fig. 297); montane .... 8. *neoleonis*

– Epigynal flaps not so dark and wide; habitat varied 11

11(10). Epigynal flaps rotated 90° and in pits (Fig. 317); body yellowish (Fig. 141); northern México, on junipers .... 11. *kastoni*

– Epigynal flaps rotated less than 60°; body varied; distribution varied 12

12(11). Abdomen with peculiar transverse markings (Figs. 169, 456); fourth pair of spots in particular a transverse stripe; legs strongly annulate (Fig. 169); face thinly covered with pale scales; epigynal flaps pale and convergent (Fig. 455); Yucatán Peninsula .. 34. *yucatecana*

– Abdomen without such transverse markings; fourth pair of spots not a transverse stripe; legs, face and epigynal flaps varied 13

13(12). Epigynal flaps with abrupt bend near posterior end (Figs. 255, 481); epigynal flaps and surface more or less flat .... 37. *bunites* (part)

– Epigynal flaps without abrupt bend near posterior end; epigynal surface varied 14

14(13). Epigynal surface more or less flat except for longitudinal ridge between flaps (Fig. 253); flaps convergent, narrow, only slightly convex; abdomen marked with large white spots (Figs. 167, 451) .... 33. *variegata* (part)

– Epigynal surface usually rises to posterior edge; if flat then lacking longitudinal ridge; flaps varied; markings varied 15

15(14). Epigynal flaps strongly convex (e.g., Figs. 236, 249, 250), parallel or slightly convergent 16

– Epigynal flaps flat or only slightly convex (similar to those in Figs. 247, 252); may be strongly convergent 20

16(15). Epigynal surface concave behind flaps (Figs. 249, 250), rising gradually to posterior margin (*furcata* group) 17

– Epigynal surface rises quickly behind flaps to mound covering most of posterior (Fig. 236) 19

17(16). Epigynal flaps fairly short, pale (Fig. 408); southern México and Guatemala .... 25. *ochracea*

– Epigynal flaps generally longer, dark (Figs. 298, 413) 18

18(17). First curve of duct narrow, second curve very broad (Figs. 397, 400); abdominal markings shiny, pale spots generally small (Figs. 396, 398, 402) .... 22. *furcata*

– First curve of duct wide, second curve narrow (Fig. 412); strong pale spots on dark abdominal dorsum (Fig. 414) .... 26. *morelos*

19(16). Epigynal flaps long and convergent, not truncate posteriorly (Figs. 4, 280); longitudinal dark bands on abdomen prominent (Fig. 281) .... 4. *edrilana*

– Epigynal flaps shorter, parallel, truncate posteriorly (Figs. 236, 262); abdomen marked with prominent white spots, without prominent dark bands (Figs. 131, 263) .... 1. *galathea* (part)

20(15). Epigynal flaps convergent, higher medially and tilted down laterally (Fig. 440); epigynal surface high between and behind teardrops, lower lateral to this (Fig. 440) .... 31. *clavator*

– Epigynal flaps not so tilted; epigynal surface flat or only slightly higher medially than laterally 21

21(20). Epigynal flaps truncate posteriorly (Fig. 236), high above surface at posterior end .... 1. *galathea* (part)

– Epigynal flaps not truncate posteriorly nor so high above surface 22

22(21). Abdomen marked much as in *galathea*, with four pairs of prominent white spots with small black spots behind them (Figs. 133, 275); epigynal flaps fairly flat and parallel (Fig. 274) .... 3. *dithalea*

– Abdomen with smaller white spots (Figs. 358, 446); epigynal flaps usually convergent (Figs. 357, 445) 23

23(22). Epigynum very flat (as in *verecunda*, Fig. 252); dark band along inner margin of epigynal opening very wide (Fig. 444) .... 32. *pallidata* (part)

– Epigynum with some relief; dark band along inner margin of epigynal opening narrow (Fig. 356) .... 17. *chaimona**

DESCRIPTIONS OF THE SPECIES OF *PELEGRINA*

The *Pelegrina* species of Canada and the northern and eastern United States can be considered reasonably well known, but the same cannot be said for the species of Arizona, México and Central America. In Arizona are many species, some poorly collected such as *P. huachuca*, *P. chaimona*, *P. tristis*, *P. chalceola*, and *P. dithalea*. Even if no additional species are discovered in Arizona, there is the danger that males and females of some of the known species have been mismatched. In México and Central America, the situation is worse, where there are probably several species that will remain undescribed for some time to come. Already there are known some female *Pelegrina* from southern and central México that apparently represent species not described here. I shall not give names to them here so as to avoid making more species names based on difficult to determine females and because with adequate collecting we may discover that they are females of already-described males. I do, however, give figures of some of them (Figs. 464–471). Figures 464–466 show a single female from Neriaco, México (state unknown), which may represent an extreme southern form of *P. chalceola*. Figures 467 and 468 show a form from Guerrero, Jalisco, and Michoacan that may be a southern form of *P. dithalea*. Figures 469–471 show a form occurring in collections from Durango.

The descriptions follow a more or less consistent format except that occasionally a feature is noted in a few species that is not noted in any others: for instance, strongly annulate legs are noted under *P. yucatecana*, but leg annulation is usually not even mentioned, and in *P. balia* the flange on the cheliceral fang is noted but the fang is ignored in most other descriptions. In the case of leg annulation and male abdominal markings, the species should be assumed to be characterized by the usual *Pelegrina* condition (legs annulate, but fairly indistinctly, and male abdomen brown above, with at most small white spots, and ringed by white side bands) unless otherwise mentioned. In the case of the other characters, such as the flange in *balia*, the distribution of the feature in all species is not fully known. Such a character is described to aid in separating the species from similar species that are known to lack it (in this example, *chalceola* lacks the flange).

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* A number of unmatched females from México may be *P. chaimona* or a species easily confused with it.

Information on the labels of type material is cited, and, where possible, the author of handwritten labels is identified. Banks, Chamberlin, Kaston, and Levi types still have with them the author's original labels, handwritten except those of Kaston, whose typewriter was distinctive. F. Pickard-Cambridge's and some of the Peckhams' types no longer have their original labels. F.P.-Cambridge's labels have been replaced by labels handwritten in pencil, perhaps by Pocock or Browning (Levi, personal communication). Some of the Peckhams' labels were rewritten by Bryant, but most labels of *Pelegrina* types are apparently original. Some are in George Peckham's handwriting, but most are in a handwriting that is probably that of Elizabeth Peckham, for it occurs in other original labels in the Peckham Collection and in some of George Peckham's correspondence to Henshaw.

1. *Pelegrina galathea* (Walckenaer, 1837) new combination

Figures 5, 10, 11, 13, 35, 78, 125, 130, 131, 190, 236, 258–263; Map 1

Attus galathea Walckenaer, 1805: 23 (cites Bosc's MS figure, pl. 1, fig. 4, ♀) (nomen nudum).

Attus galathea Walckenaer, 1837: 456, sp. 100. Type material lost or destroyed. Walckenaer (1837) cited Bosc's MS pl. 1, fig. 4, and also Abbott's fig. 405 (♀), but as Walckenaer (1805) refered only to Bosc's figure, this is to be taken as figure of type. Insofar as *A. galathea* is such a common and well-known species, and Bosc's ambiguous figure could be interpreted as another species, a NEOTYPE is here designated, 1♂ in MCZ with label "NORTH CAROLINA: Raleigh, garden, 24–31 May 1943, Brimley."

Attus nubilis Hentz, 1846: 358, pl. 21, fig. 15, ♀. Type material lost or destroyed.

Euophrys leucophaea C. L. Koch, 1846: 216, fig. 1261, ♂. Holotype 1♂ from Pennsylvania in ZMB with labels "E. Leucophaea ZMB 1794," "1794," "Holotypus," examined. Was dried; now rehydrated. NEW SYNONYMY.

Icius crassiventer Keyserling, 1884: 503, fig. 11, ♀. Holotype in MCZ 1♀ with labels "18 Icius crassiventer Keys., ♀ Massachusetts." and "18.", examined. NEW SYNONYMY.

Dendryphantes ornatus Banks, 1892: 75, pl. 4, fig. 29a, pl. 5, fig. 29, ♀. Holotype in MCZ 1♀ with labels "Dendryphantes ornatus Bks type," "Ithaca, N. Y." and "Nathan Banks Coll.," examined.

Dendryphantes hondurensis:—G. & E. Peckham, 1896, in part: 48, pl. 4, fig. 4a, ♀. Type material in MCZ 2♀ from Belize labeled "449 Dendryphantes hondurensis Peck., Type, British Honduras ♀ 1423, G. W. & E. G. Peckham Coll." (in Bryant's handwriting) which both belong to the genus *Gastromicans*, and 1♂ 2♀ labeled "461 Dendryphantes hondurensis Peck., Guatemala, G. W. & E. G. Peckham Coll." (in Bryant's handwriting), of which 1♂ 1♀ are *P. galathea* and 1♀ is in the genus *Messua*, examined. One *Gastromicans* ♀ from Belize is here designated LECTOTYPE of *D. hondurensis*, and thus *D. hondurensis* is not properly a synonym of *P. galathea*.

Metaphidippus capitatus:—F. P.-Cambridge, 1901: 272; Bonnet, 1957: 2810, in part.

Metaphidippus digitatus F. P.-Cambridge, 1901: 269, pl. 24, figs. 12, 12a–c, ♂. Type material in BMNH 1♂ and fragments of two other ♂ labeled "Dendryphantes digitatus, sp. n. Type ♂, Guatemala (Sarg.)" and 2♂ labeled "Dendryphantes digitatus, sp. n. ♂'s, México (Teapa) H. S.", examined. NEW SYNONYMY.

Beata digitata:—Simon, 1903: 841. Roewer, 1954: 1007. Bonnet, 1955: 873.

Dendryphantes capitatus:—G. & E. Peckham, 1909: 469, pl. 38, fig. 5, possibly also pl. 36, figs. 4, 4a, ♀.

Metaphidippus galathea:—Chamberlin and Ivie, 1944: 203. Kaston, 1973: 117, figs. 47–50, ♂♀.

Dendryphantes galathea:—Roewer, 1954: 1203.

Notes on Synonymy. (1) I interpret Bosc's ambiguous figure (photograph of plates in MNHN Paris seen) as the species we call *P. galathea*, following recent usage. Abbott's figure 405 probably shows a ♀ *proterva*. (2) Walckenaer's *Attus attentus* and *Attus furtivus* might also refer to this species. (3) The epigynum figured by the Peckhams for *D. hondurensis* was that of a *P. galathea* female, but despite this the female *Gastromicans* from Belize was chosen as lectotype because of the name *hondurensis* (suggesting British Honduras was intended as type locality), the label "Type," and because their figure 5 is not of *P. galathea*. Their description appears to apply to the mixture of species in the vials. (4) Kaston used the name *nubilis* for his numerous identifications of material around 1940.

Diagnosis. A widespread species, formerly confused with others in eastern North America, from which it is distinguished by the embolus shape of males and speckled abdominal dorsum, annulate legs, and convex epigynal flaps of females. Carapace wider than in most eastern species. Similar especially to the Caribbean *proxima* and southwestern *dithalea*. Can be separated from *proterva* by (males) the narrower embolus with smaller hook, darker face, and broader carapace and by (females) the abdominal markings and convex epigynal flaps.

Male. Palpus (Figs. 190, 259, 260): Embolus rectangular, narrowing abruptly just basal to opening, with small pointed, curving hook at retrolateral tip (Figs. 190, 259). *Markings* (Figs. 130, 258): Forehead band often well developed, with each branch forked and extending back to posterior eyes (Fig. 258). Cheek band weak. Clypeus brown, lacking central white spot on clypeus, with hairs overhanging chelicerae dark except sometimes a few white hairs medially. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae lacking pale scales except in some southern males. Femur of palpus only slightly paler than more distal segments, cymbium dark brown and lacking white scales except in some southern males. Femora of second, third, and fourth legs often more uniformly dark than in *proterva*, light brown base graduating to dark brown apex, though in some ♂♂, especially in south, base abruptly pale. Abdomen shows trace of white spot pattern of ♀♀. *Measurements:* Body length 3.0(3.4–3.8)4.0 mm; carapace length 1.4(1.6–1.8)2.0 mm, width/length 0.77(0.79)8.1; n = 6♂ from Michigan and Georgia.

Female. Epigynum (Figs. 261, 262): Flaps convex (Fig. 236), inner edges often parallel and close together, back edge often perpendicular to body axis and standing much higher than surface immediately behind it (Fig. 236). Surface rises fairly quickly behind flaps so that posterior surface is mostly raised, unlike the more concave surface of *proxima* and *peckhamorum* though not so uniformly high as in *proterva*. First curve of duct broad, but not so much as in *proterva*; second curve proceeds medially. *Markings* (Figs. 131, 263): Carapace covered above with white to gray scales. Clypeus relatively thinly covered with white setae. Abdominal markings dominated by central pale spots each of which is shadowed by dark behind. *Measurements:* Body length 4.0(4.6)5.7 mm; carapace length 1.7(1.8)1.9 mm, width/length 0.78(0.82)0.82; n = 5♀ from Georgia, Alabama, and Michigan.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ with full count plus 1♂ with only XXO observed, Toronto, Ontario).

Courtship (7♂ observed from seven locations: Rowan Co., Kentucky; San Jacinto, Gonzales, and Hidalgo Co., Texas; San Luis Potosí: 99°42′W, 22°28′N; near Tuxpan, Veracruz; and north of Ciudad Camargo, Chihuahua). *Raisedspread* (n = 9, 5♂). *Crouch* (Fig. 125; n = 14, 6♂): Body low (n = 5, 3♂) and horizontal (n = 14, 6♂). First legs held forward and horizontal (n = 12, 5♂), or slightly raised (n = 1), or raised about 45° (n = 1); bowed and touching or almost touching at tips (n = 9, 4♂), or straight forward (n = 4, 1♂), or slightly spread, though more parallel and lower as ♂ gets closer (n = 1). First legs flicker (n = 12, 6♂) on each series (n = 4, 2♂) up and down (n = 4, 2♂) and alternately back and forth at tips (n = 1), vigorously (ca. 5 c/s) (n = 1) but at low amplitude (n = 5, 3♂). Palpi held down (n = 9, 5♂), either resting on first leg femora (n = 1), tucked beside chelicerae (n = 3, 1♂) or over chelicerae (n = 2, 1♂) and pointing inward (n = 4, 2♂). Palpi waved (n = 10, 4♂) up and down (n = 3, 1♂) on each series (n = 6, 2♂) vigorously (ca. 5 c/s) but at low amplitude (n = 1). *Repertoires:* 1♂ raisedspread only; 2♂ crouch only; 4♂ raisedspread and crouch.

Distribution (Map 1). Eastern North American north to southern Ontario, west to the Rocky Mountains, south to Florida and Costa Rica.

Records. Many specimens, especially in MCZ and AMNH, from: *CANADA:* ONTARIO: Burlington, Hamilton, Port Credit, Windsor. *UNITED STATES* (county records): NEW HAMPSHIRE: Cheshire, Hillsborough, Strafford; VERMONT: Windham; MASSACHUSETTS: Barnstable, Dukes, Essex, Middlesex, Nantucket, Norfolk, Suffolk; RHODE ISLAND: Newport; CONNECTICUT: Fairfield, Hartford, Litchfield, Middlesex, New Haven, Tolland; NEW YORK: Dutchess, Nassau, Suffolk, Tompkins, Wyoming; NEW JERSEY: Bergen, Cape May, Gloucester, Hunterdon, Middlesex, Morris; PENNSYLVANIA: Adams, Berks, Bucks, Erie, Montgomery; OHIO: Ashtabula, Champaign; DELAWARE: Sussex; MARYLAND: Baltimore, Montgomery, Washington; DISTRICT OF COLUMBIA: Washington; WEST VIRGINIA: Mercer; VIRGINIA: Allegheny, Botetourt, Fairfax, Suffolk, Surry, Portsmouth, Richmond, Washington; KENTUCKY: Rowan; TENNESSEE: Benton, Unicoi; NORTH CAROLINA: Avery, Buncombe, Camden, Craven, Durham, Johnston, Macon, Mecklenburg, Nash, New Hanover, Pender, Transylvania, Wake, Washington, Yancey; SOUTH CAROLINA: Oconee, Orangeburg; GEORGIA: Chattahoochee, Clarke, Cobb, Glynn, Thomas, Ware; FLORIDA: Alachua, Escambia, Hillsborough, Indian River, Jefferson, Leon, Madison, Orange, Palm Beach, Pinellas, Polk, Putnam; ALABAMA: Baldwin, Colb, Coosa, Dallas, Mobile, Tallapoosa; MISSISSIPPI: Harrison, Rankin; LOUISIANA: Baton Rouge, Caddo, Jefferson, St. Charles; MICHIGAN: Calhoun, Gratiot, Hillsdale, Jackson, Livingston, Micosta, Midland, Montcalm, Muskegon, Newaygo, Oakland, Washtenaw, Wayne; INDIANA: Clay, Howard, Marion, Starke; ILLINOIS: Adams, Champaign, Peoria; MISSOURI: Berry, Boone, Jackson, Nevada, St. Charles, St. Louis, Vernon; ARKANSAS: Carroll, Conway, Hempstead, Lincoln, Washington; KANSAS: Bourbon, Cherokee, Jefferson, Riley; OKLAHOMA: Cleveland, Kiowa, Payne; TEXAS: Aransas, Bexar, Brazos, Cameron, Comanche, Dallas, Denton, Galveston, Grayson, Harris, Hidalgo, Jim Wells, Karnes, Kleberg, Leon, Llano, McLennan, Nueces, Taylor, San Jacinto, San Patricio, Wichita; COLORADO: Boulder, Denver, Sedgwick; NEW MEXICO: Doña Anna, Rio Arriba. *MÉXICO:* TAMAULIPAS: Santa Gracia, Reynosa; SAN LUIS POTOSÍ: near Ciudad del Maiz; NUEVO LEON: Villa de Santiago; COAHUILA: Gloria; CHIHUAHUA: 21 km N of Ciudad Camargo, Delicias; VERACRUZ: just S of Tuxpan, Fortin; CHIAPAS: Tuxtla Gutierrez. *GUATEMALA:* Amatitlan, Capetillo. *COSTA RICA:* Chiral Paraiso, Cartago. *BERMUDA:* Grasmere.

Natural History. In eastern North America, this species is generally found in sunlit places such as oldfields, in contrast to *P. proterva*, which is generally more of a forest dweller. In Chihuahua, *P. galathea* lives in riparian vegetation. Horner (1972) has investigated the bionomics and importance of *P. galathea* in biological control in sorghum. Steiner and Greenstone (1991) examined segregation of isozyme markers in *P. galathea*.

2. *Pelegrina proxima*
(G. & E. Peckham, 1901)
new combination
Figures 191, 237, 264–269; Map 2

Dendryphantes proxima G. & E. Peckham, 1901b (January; see G. & E. Peckham, 1909: 457): 327, pl. 28, figs. 3, 3a, ♂♀. Types in MCZ 1♂ 1♀ 2imm. "Dendryphantes proxima Pkm, 1901. Cuba Type. ♂ ♀." and "G. W. Peckham Coll." (label is original; handwritten, probably by Elizabeth Peckham), examined. The type vial also contains one palpus of another species, perhaps *Metaphidippus mannii*, which is probably misplaced.

Dendryphantes prudens G. & E. Peckham, 1901a (May): 15, pl. 4, figs. 13, 13a, 13b, ♂. Types in MCZ 2♂ 1♀ with labels "1131 Dendryphantes prudens Peckhams, B.0155, Jamaica, Kingston ♂1423, ♀4123" (in George Peckham's handwriting) and "B.0155," examined. Roewer, 1954: 1199.

Dendryphantes (*Metaphidippus*) *proximus:*—Petrunkevitch, 1911: 640.

Pelegrina geniculata Franganillo, 1930: 45, fig. 17, ♀. Types from Sierra Maestra, Cuba, in IESC, originally labeled only by a numerical code but 1♀ here designated as lectotype with labels "PF 548," "Pelegrina geniculata Franganillo, Lectotype, desig. W. Maddison 1990" (see comments regarding the generic name *Pelegrina*, earlier). 4♀ here designated as paralectotypes, 3 deposited in IESC, and 1 deposited in MCZ. Franganillo, 1936: 138,fig. 76. NEW SYNONYMY.

Metaphidippus proximus:—Bryant, 1940: 501 (= *prudens*). Bonnet, 1957: 2817.

Metaphidippus prudens:—Bryant, 1943: 496, figs. 56, 57, 63, ♂♀. Bryant, 1950: 189. Bonnet, 1957: 2817.

Dendryphantes proximus:—Roewer, 1954: 1199.

Notes on Synonymy. Bryant synonymized *prudens* with *proxima* in 1940 but then, in 1943 and 1950, used the name *prudens* without explanation. The synonymy of *Pelegrina geniculata* is based on Franganillo's description and an examination of all surviving specimens of the Franganillo collection, kindly sent to me from the IESC by Luis F. de Armas via Herbert Levi and Charles Dondale. The collection consists of 26 numbered vials containing at least 17 species (Table 4). The number and diversity of species represented is approximately what might be expected from Franganillo's papers; thus,

TABLE 4. FRANGANILLO'S COLLECTIONS OF SALTICIDS. THE IDENTIFICATIONS ARE BY ME (WITH VIAL NUMBER; E.G., PF 548, IN PARENTHESES).

Agobardus cubensis (Franganillo) *sensu* Bryant: 1 penultimale ♂ 2♀ (PF 546)
Agobardus sp.: 1♀ (PF 551)
Corythalia cf. *arcuata sensu* Bryant: 1♀ (PF 539)
Corythalia cf. *squamata* Bryant: 2♂ (PF 540)
Corythalia sp. (not *C. arcuata sensu* Bryant): 2♂ 4♀, 1 imm. (PF 539), 2♂ 1♀ (PF 540)
Hentzia palmarum: 1♂ (PF 543)
Hentzia cf. *tibialis*: 1♂
Hentzia sp.: 1♀ (PF 544), 1♀ (PF 544-2), 1♀ (PF 562), 1 imm. (PF 564)
Lyssomanes antillanus: 2♀, 2 imm. (PF 535), 3♀ (PF 536), 5♂ 1♀ (PF 542), 1♀, 4 imm. (PF 543)
Lyssomanes sp., 1 imm. (PF 532)
Menemerus bivittatus: 3♀, 1 imm. (PF 541), 1 penultimate ♀ (PF 567), 1 penultimate ♂, 1♀ (PF 568), 1♂ (PF 569)
Metacyrba taeniola: 2♀ (PF 575)
Metacyrba sp., 1♀ (PF 575)
Pelegrina proxima, 5♀ (PF 548), 1♂ (PF 569)
Nilakantha or *Thiodina* sp.: 1 penultimate ♂ (PF 538)
Nilakantha sp.: 1♀ (PF 544-2)
Phidippus audax: 1♂, 1 penultimate ♂ (PF 571)
Platycryptus sp., 1♂ (PF 560)
Plexippus paykulli: 2♂ (PF 534), 3♀ (PF 535), 1♀ (PF 566)
Synemosyna smithii: 1♀ (PF 550).

the collection may remain more or less complete. The collection lacks labels indicating locality or species (Alayón, 1982); thus, it is possible that we will never identify the type specimens of *Pelegrina geniculata* with complete certainty. However, I will argue that *Pelegrina geniculata* is a junior synonym of *Dendryphantes proximus* and that, in particular, the types are the females in vial PF 548. Franganillo's description is rather detailed in some respects, and a figure of the epigynum was provided. The described size, shape of the carapace, nature of the clypeus, chelicerae, sternum, eyes, and legs all fig *proxima*. The placement of *Pelegrina* in the Unidentati implies a single simple tooth on the retromargin of the cheliceral fang furrow, consistent with *proxima* and inconsistent with some genera such as *Hentzia*. The description of *Pelegrina geniculata* contains nothing that would rule out *proxima*, and several features that in particular point to this species. These are as follows:

1. *Leg spination:* Franganillo's description of the spination of the first and fourth legs can apply only to *P. proxima* among the species in Franganillo's collection. Table 5 lists species in his collection and their spination. The spination of 3-3 on the tibia and 2-2 on the metatarsus described for *Pelegrina geniculata* narrows down the species to a dendryphantine, and the fourth tibia spination matches *P. proxima* exactly. Table 5 also lists a few other Cuban salticids not in Franganillo's collection. Among species known from Cuba but not listed in the table, Bryant's (1940) descriptions indicate that none have the leg spination described for *Pelegrina*, except *Sidusa turquinensis, Icius wickhami, Phidippus* spp., and *Neon nigriceps*, which can be ruled out as *Pelegrina geniculata* on other grounds. Though spination can sometimes be unreliable (Maddison, 1987), spination differences such as those seen between dendryphantines and the other subfamilies listed in Table 5 are reasonably reliable.
2. *Epigynum:* Franganillo's (1930) epigynal figure shows two dark teardrop-shaped objects and posterior notch. No

TABLE 5. LEG SPINATION OF CUBAN SALTICIDS. SPECIMENS MARKED BY ASTERISK (*) ARE FROM FRANGANIRO'S COLLECTION. ALL SPECIMENS IN FRANGANILLO'S COLLECTION ARE INCLUDED EXCEPT *LYSSOMANES* AND *SYNEMOSYNA*, WHICH ARE CLEARLY NOT *PELEGRINA* BY THE DESCRIPTION. THE SPINATION PATTERN OF *PELEGRINA GENICULATA* IS TAKEN FROM FRANGANILLO'S (1939) DESCRIPTION.[a]

	First Pair Tibia				Metatarsus				Fourth Pair Tibia				Metatarsus Non-terminal
	av	pv	al	pl	av	pv	al	pl	av	pv	al	pl	
Pelegrina geniculata, (Franganillo's description)	3	3	0	0	2	2	0	0	2	1	0	2	1
Dendryphantinae													
*Pelegrina proxima**	3	3	0	0	2	2	0	0	2	1	0	2	0
Hentzia sp., 2♀*	3	3	0	0	2	2	0	0	1	1	0	0	0
Phidippus audax, 1♂ 1p♂*	3	3	0	0	2	2	0	0	2	1	1	2	3–4
Eris flava	3	3	0	0	2	2	0	0	1	1	1	1	2
Zygoballus sp.	3	3	0	0	2	2	0	0	2	1	1	1	?
Euophryinae													
Agobardus cubensis, 2♀*	4	4	0	0	2	2	2	2	2	1	3	3	4
Agobardus sp., 1♀*	4	4	2	0	3	3	1	1	2	1	3	3	4
Corythalia sp. A, 2♀*	2	3	2	0	2	2	2	2	2	1	2	2	5
Others													
Habronattus spp.	3	2	0	0	2	2	0	0	2	1	2	3	?
Marpissa pikei	4	4	0	0	?	?	?	?	1	0	0	0	0
Menemerus bivittatus, 3♀*	4	2	0	0	2	2	0	0	1	1	0	0	0
Metacyrba taeniola, 2♀*	2	0	0	0	2	2	0	0	0	0	0	0	0
Metacyrba sp., 1♀*	2	0	0	0	2	2	0	0	0	0	0	0	0
Nilakantha sp.*	2	1	0	0	2	2	0	0	0	0	1	1	0
Platycryptus sp.*	4	3	0	0	2	2	0	0	1	1	0	1	0
Plexippus paykulli, 3♀*	4	3	0	0	2	2	0	0	2	1	3	3	7

[a] Abbreviations: av, pv, al, pl, anterior and posterior of ventral and lateral; p♂, penultimate male.

epigynum from Cuba known to me would have this appearance except that of *P. proxima*, whose long epigynal flaps and posterior notch are unique on Cuba. Interpreting the teardrop-shaped objects as spermathecae or other structures cannot help the figure to be applied to any other Cuban species known to me. Certainly no euophryines have epigyna like this, nor any of the other dendryphantines known from Cuba. The only difficulty with considering the epigynal figure conclusive is that in 1936 the same figure was published inverted as figure 76, 2. If the 1936 orientation were correct, then the epigynum would not apply to *P. proxima*, but it would also not apply to any other salticid known to me.

3. *Abdominal markings:* Franganillo describes a series of longitudinal bands. Centrally, there is one band described as "*leonada*." L. Avilés (personal communication) suggests that this term may mean "the color of a lion," namely, light brown. According to the description, this central band is flanked by pale bands, which are flanked by more light brown bands. The pale bands are toothed and have one particularly large, oblique, curved tooth near the spinnerets. This describes *P. proxima* females exactly (Fig. 269), the large teeth being the fourth pair of spots (see Fig. 2). Other Cuban salticids that have somewhat similar markings are *Platycryptus* sp., *Menemerus bivittatus*, and some of the *Agobardus* species, but their markings are not exact matches and these species can be ruled out on other grounds such as size and spines.
4. *Specimens cited:* Vial PF 548 contains

> several adults, all females of *P. proxima*. The description notes the material being six females; the vial contains five females. No other vial in the collection contains so many females without accompanying males or immatures.

This evidence taken together indicates that the description of *Pelegrina geniculata* applies to *P. proxima* and in particular to the females in vial PF 548. Accordingly, one of these females has been designated as a lectotype of *Pelegrina geniculata*.

Diagnosis. The only known Caribbean *Pelegrina*, differing from the similar *galathea* in having more lineate abdominal markings and in details of genitalia.

Male. Palpus (Figs. 191, 265, 266): Embolus rectangular, not narrowing so abruptly near the opening as in *galathea*; retrolateral ramus an angle not prolonged into a hook (Figs. 191, 265). *Markings* (Fig. 264): Cheek band very weak. Clypeus brown, with hairs overhanging chelicerae dark with a few white medially. White forehead band contacts AMEs dorsally 10:30 to 12:30. Chelicerae with small medial patch of pale scales. Cymbium usually lacking white scales. Abdomen often showing a trace of the longitudinal white bands of females. *Measurements:* Body length 2.8(3.0)4.2 mm; carapace length 1.5(1.6)2.1 mm, width/length 0.78(0.79)0.80; n = 5♂ from Havana, Cuba.

Female. Epigynum (Figs. 237, 267, 268): Flaps long, fairly convex, dark, not truncated behind as in *galathea*. Surface behind flaps more or less concave, rising gradually so that posterior mound restricted to guide area or absent (Fig. 237). First curve of duct narrow; second curve proceeds medially. *Markings* (Fig. 269): Carapace covered above thinly with white scales. Clypeus densely covered with white scales. Abdominal white spots arranged into two median longitudinal white bands on brown background. *Measurements:* Body length 3.5(3.7)4.8 mm; carapace length 1.5(1.6)1.9 mm, width/length 0.76(0.76) 0.79; n = 5♀ from Havana, Cuba.

Distribution (Map 2). Known from the larger Caribbean islands.

Records. BAHAMAS: Grand Bahama Island, Freeport (1♀, AMNH); Rum Cay, near Port Nelson (2♂, AMNH). *CUBA:* Havana (many ♂♀, MCZ); Havana: Santiago de las Vegas (6♂ 5♀, MCZ); Marianao Habana (2♀, AMNH); Soledad, Cienfuegos (5♂ 4♀, MCZ, AMNH); Oriente: Santiago de Cuba (1♀, MCZ); Trinidad Mtns., Hanabanillo Falls (1♂, MCZ); Holquin (♂♀, MCZ); Banes (1♀, MCZ); 7 km N of Vinales (2♂ 1♀, AMNH); Vega Alta, Santa Clara (4♂, AMNH); San Vicente, Pinar del Rio (4♂ 2♀, AMNH). *JAMAICA:* Christiana (1♀, AMNH); Claremont (1♂, AMNH); Spanish Town (2♀, MCZ); St. Andrew: Mona (5♂ 1♀, MCZ); St. Andrew: Liquanea (1♀, MCZ); St. Ann, 1.6 km E of Moneague (1♀, MCZ). *DOMINICAN REPUBLIC:* S. O. de las Matas (1♂, MCZ); La Vega (1♀, MCZ); Ciudad Trujillo (1♀, MCZ). *HAITI:* Diquini (1♂, MCZ); Enery, Bata (1♂, AMNH); hills nr. Port-au-Prince (1♂, MCZ); Ouest (1♂ 1♀, MCZ).

3. *Pelegrina dithalea* new species
Figures 132, 133, 192, 270–275; Map 3

Holotype male and paratype female in MCZ, with label "ARIZONA: Santa Cruz Co., Sycamore Canyon, ca. 9 mi [14 km] W of Peña Blanca Lake, W of Nogales, ca. 4000 ft. el. [1,220 m], 19 Jun 1985 W. Maddison 85-060, sweeping in canyon where stream flowing."

Etymology. An arbitrary combination of letters, to be treated as a noun in apposition.

Diagnosis. Similar in markings to *galathea*, from which it differs by the embolus that lacks the hooklike retrolateral ramus and that widens toward the tip. Embolus resembles that of *chaimona*, but the rami are farther apart (Figs. 192, 206).

Male. Palpus (Figs. 192, 271, 272): Embolus widens slightly from near base to near tip. Rami subequal, though retrolateral is more prominent. *Markings* (Figs. 132, 270): On carapace, white bars from side bands to fovea usually strong and fused into inverted V mark. Cheek band weak. Clypeus brown, hairs overhanging chelicerae white centrally, dark laterally. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with small medial patch of white scales. Cymbium with few white scales. Legs fairly distinctly annulate. Abdomen shows traces of white spots of female. *Measurements:* Body length 3.6(4.0)4.2 mm; carapace length 1.9(2.0)2.1 mm, width/length 0.77(0.78)0.81; n = 5♂ from Sycamore Canyon, Arizona.

Female. Epigynum (Figs. 273, 274): Flaps slightly convex; posterior edge not standing so high above surface behind them as in *galathea.* Surface rises immediately into gentle mound covering all of posterior. Second curve of duct proceeds medially. *Markings* (Figs. 133, 275): Carapace covered by scales mostly gray-white, and some brown scales around fovea, and just medial to posterior eyes. Clypeus densely covered with white scales. Abdominal markings gray-brown with large white spots and small dark spots, much like *galathea* (Fig. 275). *Measurements:* Body length 3.9, 4.3, 5.3 mm; carapace length 2.0, 2.1, 2.1 mm, width/length 0.75, 0.77, 0.79; n = 3♀ from Santa Cruz and Pima Counties, Arizona.

Male/Female Matching. The two sexes were co-collected in Sycamore Canyon and Kitt Peak, have similar markings on the abdomen, and are similar in markings and form to *galathea.*

Courtship (2♂ observed from Sycamore Canyon, Arizona). *Crouch* (n = 8, 2♂): Body low and horizontal (n = 2, 1♂). First legs fairly wide to bowed and parallel (n = 6, 2♂), low (n = 8, 2♂) to raised a bit (n = 4, 1♂), waved on series (n = 8, 2♂) at low amplitude (n = 4, 2♂). Palpi held down (n = 2, 1♂), waved up and down on series so as to drum on substrate (n = 2, 1♂), still on pause (n = 2, 1♂).

Distribution (Map 3). Southern Arizona.

Records. UNITED STATES: ARIZONA: Pima Co.: Quinlan Mtns., picnic area nr. Kitt Peak Observatory, 1,900–2,000 m el., 20 June 1985 (3♂ 1♀, MCZ); Santa Cruz Co.: Sycamore Canyon, ca. 14 km W of Peña Blanca Lake, ca. 1,200 m el., 19 June 1985 (12♂ 1♀, MCZ); Santa Rita Mtns., Madera Canyon, nr. Bog Springs Cmpgd., ca. 1,500 m el., 17 June 1985 (1♀, MCZ).

Natural History. In oak woodland at all three Arizona localities. At Sycamore Canyon, beating vegetation, especially shaded, deep in canyon where stream still flowing in June. At Kitt Peak, beating oaks and other shrubs and trees.

4. *Pelegrina edrilana* new species
Figures 4, 193, 276–281; Map 4

Holotype male with one immature in AMNH with label "MEXICO: Tlalpam, D.F. [Distrito Federal], Apr.17, 1946, J. C. Pallister."

Etymology. An arbitrary combination of letters, to be treated as an adjective.

Diagnosis. An enigmatic species from southcentral México with a palpus in some ways resembling each of *galathea, proterva,* and *peckhamorum.* The swollen base of the erect portion of the embolus is wider than in *galathea,* thought not so extreme as in *proterva.* The retrolateral ramus is wider than in *galathea,* though not so long and hooked as in *proterva.*

Male. Palpus (Figs. 193, 277, 278): Embolus swollen at the base of the erect portion; narrowing distally near opening. Retrolateral ramus extended into short stout hook (Figs. 193, 277). *Markings* (Fig. 276): Cheek band fairly dense but not so dense as *proterva.* Clypeus brown; hairs overhanging chelicerae dark except for few white medially. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with narrow medial patch of pale scales from base to ½ length. Cymbium lacking white scales. *Measurements:* Body length 3.7(3.7–3.8)3.9 mm; carapace length 1.7(1.8)1.9 mm, width/length 0.72(0.76) 0.78; n = 5♂ from Distrito Federal and Durango, México.

Female. Epigynum (Figs. 4, 279, 280): Flaps long and convex, turning slightly inward, shiny and generally pale. Surface rises to mound quickly behind flaps; in many specimens the mound has two distinct front corners (Fig. 280). Females from Oaxaca (Figs. 4, 279), which may represent a distinct species, have somewhat longer epigynal flaps and a gentler mound on the posterior surface. First curve of duct wide; second curve proceeds obliquely anteriorly. *Markings* (Fig. 281): Carapace covered with white scales. Clypeus densely covered with white scales. Abdomen marked somewhat as *proterva,* with brown background having white side bands and central spots. *Measurements:* Body length 3.4(4.8–5.2)5.4 mm; carapace length 1.7(1.9)2.0 mm, width/length 0.75(0.77) 0.80; n = 7♀ from Distrito Federal, México.

Male/Female Matching. Males and females were co-collected and have a common distribution; they have similar size and markings.

Distribution (Map 4). México. Most specimens from the Distrito Federal; also known from Durango, Oaxaca, and San Luis Potosí.

Records. MÉXICO: SAN LUIS POTOSÍ: Guanajuato border on Hwy 57, ca. 100°45′W, 21°35′N (1♀, MCZ); DURANGO: Palos Colorados, 5 August 1947 (1♂ 1♀, AMNH); DISTRITO FEDERAL: Contreras, 2,500 m, 23 July 1947 (2♀, AMNH); México City, January 1941 (1♂, AMNH); Pedregal, 8 August 1947 (1♂, AMNH); San Jeronimo, 11 June, 21 June, and 1 July 1946 (2♂ 8♀, AMNH); Tlalpam, 2,300 m, 21 July 1947 (1♀, AMNH); 17 April 1946 (1♂, AMNH); OAXACA: 2 km S of El Tule, 1,500 m el., ca. 96°40′W, 17°02′N (3♀, MCZ).

Natural History. Collected from Acacia savannah in Oaxaca and from mesquite in San Luis Potosí.

5. *Pelegrina proterva* (Walckenaer, 1837) new combination

Figues 2, 3, 6–9, 15, 34, 134, 135, 194, 238, 282–287; Map 5

Attus protervus Walckenaer, 1837: 443. Type 1♂, lost, shown in figure 402 of Abbot (1792), whose caption reads "Taken 8th June, in a Dirt daubers Nest the only one I have seen."

?*Attus capitatus* Hentz, 1845: 200, pl. 17, fig. 15, ♂.

?*Attus octavus* Hentz, 1846: 365, pl. 22, fig 15, ♀.

Attus aestivalis G. & E. Peckham, 1883: 2, figs. 2, 2a–c, ♂♀. Types lost or destroyed (Bryant, 1941).

Dendryphantes capitatus:—G. & E. Peckham, 1909: 469, pl. 36, figs. 4b, c, pl. 38, fig. 5a, possibly also pl. 36, figs. 4, 4a, ♂♀. Roewer, 1954: 1202.

Dendryphantes atopodon Chamberlin, 1925a: 234. Holotype in MCZ 1♂ with label "Dendryphantes atopodon Chamb., ♂ holotype, Va.: Scott's Runn, July, R. V. Chamberlin, Coll.", examined. Roewer, 1954: 1206. Bonnet, 1956: 1392.

Metaphidippus protervus:—Chamberlin and Ivie, 1944: 204 (not fig. 23). Kaston, 1973: 117, figs. 43–46, ♂♀.

Metaphidippus capitatus:—Bonnet, 1957: 2810, in part.

Notes on Synonymy. (1) Walckenaer's first description of *Attus protervus* (p. 443, after Abbot's fig. 402) probably refers to this *Pelegrina*; his second (p. 465, after Abbot's fig. 463) probably to *Maevia inclemens* (see Walckenaer, 1837: 425; Chamberlin and Ivie, 1941: fig. 23). *Attus attentus* Walckenaer (species number 61, Abbot's fig. 157) may also be *P. proterva. Attus capitatus* Hentz, though considered a synonym of *proterva* by Chamberlin and Ivie (1941), might equally well be *P. galathea, Eris militaris,* or another species. (2) *Euophrys concolor* Banks was synonymized with *P. proterva* by Edwards (1980), apparently because one of the two specimens in the type vial is a ♀ *P. proterva*. Banks' description clearly refers to the other specimen (by color, length of fourth leg, and epigynum with single opening and two posterior circles), which is therefore the holotype. This holotype is of the species now called *Sitticus cursor* Barrows, which should henceforth be called *Sitticus concolor* (NEW COMBINATION), with the name *cursor* relegated to synonymy (NEW SYNONYMY). Since Banks refers to only a single female, the *proterva* ♀ was probably added to the vial subsequently. (3) Kaston used the name *octavus* for his numerous identifications of material around 1940.

Diagnosis. The white face markings of males, abdominal markings of females, and the genitalia distinguish this species, which is abundant in woodlands throughout much of Canada and found south to Florida. Long confused with *galathea* under the name *capitatus,* the two species are similar in embolus but distinct in numerous ways. *Pelegrina proterva* can be separated from *galathea* by (males) the broader embolus with larger hook, strongly marked face, and narrower carapace and by (females) the abdominal markings and flat epigynal flaps. Male markings much like those of *peckhamorum,* from which *proterva* differs in having a narrower embolus and flatter epigynum. Palpus much like that of the central Mexican *edrilana*, differing in details.

Male. Palpus (Figs. 3, 6–9, 283, 284): Erect portion of embolus inflated basally, wide and transparent centrally. Terminal portion near opening much narrower than basal portion. Retrolateral ramus a long curved hook (Fig. 283). *Markings* (Figs. 134, 282): Carapace with strong white markings, including forehead and side bands. Cheek band dense and distinct from side bands. Clypeus with prominent diamond of white scales between AMEs and overhanging chelicerae; lateral to this the clypeus and hairs overhanging chelicerae are dark. White forehead band contacts AMEs dorsally; setae ringing AMEs white 7:00–12:00 and 2:00–4:00. Chelicerae lacking pale scales. Femur of palpus distinctly paler than more distal segments. Cymbium with generally dense patch of white scales centrally. Second, third, and fourth legs with femur bases abruptly pale. Abdominal dorsum usually light brown with dark spots between side bands. *Measurements:* Body length 3.3(3.6)4.2 mm; carapace length 1.6(1.6)1.9 mm, width/length 0.74(0.78)0.81; n = 7♂ from Ontario, Iowa, and Saskatchewan.

Female. Epigynum (Figs. 238, 285, 286): Flaps fairly flat, dark, and slightly convergent. Surface smooth, rises fairly abruptly behind flaps into wide though gentle mound covering most of posterior. First curve of duct broad; second curve proceeds obliquely anteriorly. *Markings* (Figs. 2, 135, 287): Carapace covered with white and some brown scales. Face somewhat darker than *galathea,* relatively thinly covered with white scales, especially in southern females. Legs only slightly annulate, beige to light brown with darker markings reddish brown markings. Abdomen pale on sides, with two reddish brown longitudinal bands above broken by oblique to transverse white stripes. *Measurements:* Body length 4.4(5.1–5.3)5.6 mm; carapace length 1.6(1.9)2.0 mm, width/length 0.75(0.76)0.79; n = 6♀ from Iowa and Ontario.

Geographical Variation. Southern females have a darker carapace with distinct side bands, a face more sparsely covered with pale scales, and an abdomen with the central pale spots coalesced medially into a chevron stripe, which is also seen in some southern males. Some males from Florida, Georgia, and South Carolina have a narrower embolus and lack the white scales between the AMEs on the clypeus.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂, Hollis, New Hampshire).

Courtship (10♂ observed from Shenandoah Co., Virginia; Middlesex and Barnstable Counties, Massachusetts; Dorchester and Caroline Counties, Maryland; Thunder Bay, Ontario; Binscarth, Manitoba; see also Peckham and Peckham, 1889: 45, fig. 18). Has the crouch display with body often high and first legs low. *Raisedspread* (n = 13, 5♂). *Crouch* (Fig. 134; n = 15, 7♂): Body horizontal, held low (n = 1), at about normal height (n = 6, 3♂) or high (n = 8, 3 ♂). First legs forward and low (n = 15, 7♂), either horizontal (n = 3, 2♂) or even lower than body (n = 10, 4♂), bowed and parallel (n = 4, 2♂), or slightly spread (n = 3, 1♂). On one observation the legs were slightly raised at first but just before he touched ♀ they were lower than body. First legs waving little if a all (n = 2, 1♂) or not at all (n = 4, 1♂). Palpi held down (n = 7, 4♂) or forward (n = 7, 3♂); moved forward (n = 10, 5♂) and waved up and down on each series (n = 15, 7♂). Abdomen depressed on each series (n = 1), twitches at least occasionally (n = 4, 1♂). *Repertoires:* 3♂ raisedspread only; 5♂ crouch only; 2♂ raisedspread and crouch. Several times the display proceeded directly from the raisedspread stage to touching the female without a distinct crouch display (n = 8, 4♂).

Distribution (Map 5). Across much of Canada and northeastern United States, south in the east to Florida and Texas. Although the following records include only few from Canada, this is due to my examining only collections at museums in the United States; *proterva* is actually very common throughout much of Canada.

Records. Many specimens, especially in MCZ and AMNH, from: *CANADA:* NOVA SCOTIA: Kentville; QUEBEC: St. Louis de France, Quebec City; ONTARIO: Martin River 58 km N of North Bay, Ottawa, Belleville, Barrie, 36 km E of Thunder Bay, Sudbury Dist.: Espanola, 15 km E of Espanola, nr. Bruce Mines nr. Sault St. Marie, 14 km S of Pte. Au Baril (Parry Sound Dist.), 20 km E of Manitoba border on Hwy 17; Lake Temagami, Port Credit; SASKATCHEWAN: Waskana Creek, North Battleford; MANITOBA: Sandilands Provincial Forest, Binscarth, Gypsumville; BRITISH COLUMBIA: Salmon Arm. *UNITED STATES* (county records): MAINE: Hancock, Lincoln; NEW HAMPSHIRE: Belknap, Carroll, Cheshire, Grafton, Hillsborough, Sullivan; VERMONT: Addison, Caledonia, Chittenden, Rutland, Windham, Windsor; MASSACHUSETTS: Barnstable, Berkshire, Dukes, Essex, Franklin, Hampden, Middlesex, Nantucket, Norfolk, Suffolk, Worcester; RHODE ISLAND: Washington; CONNECTICUT: Fairfield, Middlesex, New Haven, New London, Tolland; NEW YORK: Hamilton, Nassau, New York City, Thompkins, Westchester; NEW JERSEY: Bergen, Cape May, Hunterdon, Passaic; PENNSYLVANIA: Adams, Bucks, Carbon, Centre, Forest, Monroe, Montgomery, Schuylkill, Warren, York; OHIO: Champaign; MARYLAND: Caroline, Charles, Dorchester; WEST VIRGINIA: Mercer; VIRGINIA: Fairfax, Rockingham, Shenandoah, Suffolk, Washington; KENTUCKY: Hardin, Rowan; TENNESSEE: Grundy, Sevier, Unicoi; NORTH CAROLINA: Buncombe, Durham, Macon; SOUTH CAROLINA: Horry; GEORGIA: Cobb, Polk, Thomas; FLORIDA: Alachua; ALABAMA: Clarke, Dekalb, Jackson; MICHIGAN: Berrien, Calhoun, Charlevoix, Cheboygan, Crawford, Eaton, Emmet, Genesee, Hillsdale, Isabella, Jackson, Kent, Lake, Livingston, Mackinac, Marquette, Midland, Muskegon, Osceola, Sanilac, Washtenaw, Wayne; INDIANA: Jasper, Marion, Starke; WISCONSIN: Ashland, Chippewa, Crawford, Dane, Door, Douglas, Grant, Green Lake, Iowa, Jefferson, Lincoln, Manitowac, Marathon, Price, Richland, Rusk, Sauk, Shawano, Taylor, Waushara; ILLINOIS: Champaign, Cook, Mason; MINNESOTA: Blue Earth, Freeborn, Marshall, Olmsted, Steele, Winona; IOWA: Boone, Clayton, Hancock, Winnebago, Woodbury; MISSOURI: Boone, Cole, Jackson, Johnson, St. Louis; NEBRASKA: Lancaster, Loup, Saline; KANSAS: Decateur, Riley; TEXAS: Anderson, Denton, Hardin, Sabine, San Jacinto; MONTANA: Ravalli, Stillwater; COLORADO: Fremont, Larimer.

Natural History. Found on various trees and shrubs, usually in or near forests; less often found in fields and on herbs than is *P. galathea.* Dondale (1961) describes the life history of *P. proterva* in Nova Scotia.

6. *Pelegrina peckhamorum* (Kaston, 1973) new combination

Figures 126, 136, 137, 195, 239, 288–293; Map 8

Metaphidippus peckhamorum Kaston, 1973: 115, figs. 39–42, ♂♀. Holotype ♂ and paratype ♀ in AMNH with labels "Holotype ♂ + allotype ♀, Metaphidippus peckhamorum n. sp., det by B. J. Kaston (1949)" and "col. by B. Malkin, Lakehurst, N. J. 25 May 1941," examined. Brignoli, 1983: 643.

Diagnosis. A relatively rare eastern species with male body form and markings very much like *proterva* but outstanding for its very broad embolus. The female is best distinguished from other eastern species by the indistinct markings and large, slightly concave epigynum, with flaps that are more convex than in *proterva* and that have the posterior edge not truncate as in *galathea*.

Male. Palpus (Figs. 195, 289, 290): Embolus very broad, tapering but still broad at tip. Rami well separated; retrolateral ramus not elongate as in *proterva*. *Markings* (Figs. 136, 288): Cheek band dense and discrete. Clypeus with prominent diamond of white scales between AMEs and overhanging chelicerae; lateral to this the clypeus and hairs overhanging chelicerae are dark. White forehead band contacts AMEs dorsally; setae ringing AMEs white 7:00–12:30 and 2:00–4:00. Chelicerae lacking pale scales. Femur of palpus distinctly paler than more distal segments. Cymbium with white scales centrally. Leg femora distinctly paler basally. *Measurements:* Body length 3.0(3.6)3.7 mm; carapace length 1.4(1.7)1.8 mm, width/length 0.74(0.76)0.78; n = 5♂ from Barnstable County, Massachusetts.

Female. Epigynum (Figs. 239, 291, 292): Large. Flaps long, fairly convex, usually convergent. Surface rises very gradually behind flaps; most of posterior area concave. First curve of duct broad; second curve proceeds obliquely anteriorly. *Markings* (Figs. 137, 293): Carapace covered with yellowish scales. Clypeus covered thinly with yellowish white scales. Abdomen more uniform in color than *proterva,* light brown with pale spots. *Measurements:* Body length 3.6(4.0)5.4 mm; carapace length 1.7(1.9)2.1 mm, width/length 0.73(0.77)0.78; n = 5♀ from Massachusetts and Arkansas.

Male/Female Matching. Males and females have been co-collected in New Jersey, Arkansas, and Massachusetts; otherwise, they are the only unmatched ♂♀ in the northeast.

Courtship (4♂ observed from Cape Cod, Massachusetts). Has the crouch display with body high and first legs low as in *P. proterva. Raisedspread* (n = 17, 3♂). *Crouch* (Fig. 126; n = 12, 3♂): Body held normal-high (n = 6, 1♂) or high (n = 6, 2♂). First legs held horizontal (n = 12, 3♂) and lower than body (n = 3, 1♂), waved little if at all (n = 9, 2♂). Palpi held down (n = 12, 3♂); still on pause (n = 2, 1♂), waved on series (n = 4, 2♂) up and down (n = 5, 1♂), specifically from down to forward (n = 2, 2♂), with medium-high amplitude (n = 5, 1♂). Abdomen still on series (n = 4, 2♂) but twitched on pause (n = 4, 2♂). *Repertoires:* 1♂ raisedspread only; 2♂ raisedspread and crouch; 1♂ crouch only.

Distribution (Map 8). Known from Massachusetts, New York, New Jersey, Ohio (Kaston, 1973), Indiana (Kaston, 1973), Tennessee, Arkansas, and Texas.

Records. UNITED STATES: MASSACHUSETTS: Barnstable Co.: Chatham (1♂ 3 ♀, MCZ), South Chatham (6♂, MCZ), nr. North Truro at junction of Hwy 6 and Head of the Meadow Road (10♂ 3♀, MCZ); Dukes Co.: Oak Bluffs (1♂, MCZ); NEW YORK: Davisville; Suffolk Co.: Riverhead (2♂, AMNH), Coram (2♂ 1♀, AMNH); NEW JERSEY: Burlington Co.: 11 km W of New Gretna (4♂ 2♀; AMNH), Lebanon State Forest (1♂, AMNH); Middlesex Co.: Old Bridge (1♂, AMNH); Morris Co.: Chatham, Great Swamp (1♀, AMNH); Ocean Co.: Lakehurst (22♂ 11♀, AMNH), Lake Horicon nr. Lakehurst (3♀, AMNH), 6 km W of Lakehurst (2♂ 3♀, AMNH); TENNESSEE: Knox Co.: University of Tennessee farm 3 (1♂, AMNH); ARKANSAS: Washington Co.: 24 km S of Prairie Grove in Cove Creek Valley of the Boston Mtns. (28♂ 6♀, MCZ), 24 km W of Prairie Grove (5♂ 1♀, MCZ); TEXAS: Leon Co.: SW of Oakwood (1♂, AMNH).

Natural History. May specialize on oaks. On Cape Cod, Massachusetts, collected by beating oaks and cranberries in understory of pine forest (1 record), sweeping oak-pitch pine (2 records), and beating oaks (1 record).

7. *Pelegrina neoleonis* new species
Figures 138, 196, 294–298; Map 6

Holotype male and paratype female in MCZ with label "MEXICO: NUEVO LEON: Chipinque Mesa just S of Monterrey, ca. 4500 ft. [1,370 m]; ca. 100.4°W 25.6°N, 2 Jun 1983 W. Maddison & R. S. Anderson 83-034, beating and sweeping forest understory."

Etymology. After the state from which most known specimens come.

Diagnosis. A Mexican species similar to *tristis* with a distinctive long, curved retrolateral ramus on the embolus. The erect portion of the embolus is narrower than in *tristis.* No characters have yet been found to distinguish the female from that of *tristis,* except locality.

Male (from Nuevo León). Palpus (Figs. 196, 295): Embolus distinctive; broad, with retrolateral ramus extended into long hook, much as in *tristis,* but ramus bears small bump and is blunt at tip; prolateral ramus obtuse or only slightly acute. *Markings* (Figs. 138, 294): Cheek band weak. Clypeus brown; hairs overhanging chelicerae dark. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae lack pale scales. Femur of palpus distinctly pale than more distal segments. Cymbium with none to few white scales. Femur of third leg pale on basal ⅓. *Measurements:* Body length 3.6, 3.7 mm; carapace length 1.7, 1.8, 1.9 mm, width/length 0.75, 0.75, 0.76; n = 3♂ from Nuevo León and San Luis Potosí.

Female. Epigynum (Figs. 296, 297): Flaps large and dark, flat and inwardly rotated. Surface gently convex, highest medially behind flaps, except for surface diving deeply under flaps. First curve of duct very broad, expanded to the side and posterior so that second curve begins well posteriad of posteriormost portion of flap (in contrast with the sympatric *clavator*); second curve proceeds anteriorly. Inner surface of third curve rough, with numerous projections. *Markings* (Fig. 298): Carapace dark above, covered with transparent reflective scales; sides covered thinly with white scales. Clypeus densely covered with white scales. Legs brown. Abdomen fairly dark, with only small pale spots. *Measurements:* Body length 4.3(5.9–6.1)6.2 mm; carapace length 1.9(2.2–2.3)2.3 mm, width/length 0.74(0.77–0.79)0.83; n = 4♀ from Nuevo León, Hidalgo, and Oaxaca.

Male/Female Matching. This association is indicated by co-collecting in Nuevo León; by the large epigynal flaps, which would be expected in a species with such a robust embolus; and by the similarity of male and female with those of *tristis*.

Geographical Variation. The single male from San Luis Potosí differs from those of Nuevo León in having a sharper retrolateral prong on the embolus, more extensive white scales surrounding AMEs, a small patch of pale scales medially on chelicerae, and the femur of palpus relatively dark.

Courtship (3♂ observed from Chipinque Mesa, Nuevo León; Cerro Potosí, Nuevo León; and Xilitla, San Luis Potosí). *Raisedspread* (n = 3, 2♂). *Crouch* (n = 6, 3♂): Body held in normal to low position (n = 1). First legs bowed and forward (n = 4, 2♂), raised to ca. 30° (n = 2, 2♂), or horizontal (n = 1), or femora low but tips curl upward (n = 1). Leg tips not touching (n = 2, 2♂), apparently not waved (n = 3, 2♂), or waved only slightly (n = 2, 1♂) on series (n = 1). Palpi down (n = 6, 3♂), over chelicerae (n = 1) or curled under tips of chelicerae (n = 1), waved (n = 6, 3♂) up and down (n = 1) or outward (n = 1) on series (n = 3, 2♂) ca. 5–7 c/s (n = 1). Abdomen depressed a bit on series (n = 1), or at end of series (n = 1). *Repertoires:* 1♂ crouch only; 2♂ raisedspread and crouch.

Distribution (Map 6). Northeastern México south to Oaxaca.

Records. MÉXICO: SAN LUIS POTOSÍ: 21 km W of Xilitla on Hwy 120, 99°05′W, 21°18′N, 12 June 1983 (1♂, MCZ); NUEVO LEÓN: Chipinque Mesa just S of Monterrey, 100.4°W, 25.6°N, 2 June 1983 (1♂ 1♀, MCZ); Cerro Potosí, ca. 100°14′W, 24°52′N, 4 June 1983 (1♂ 1♀, MCZ); HIDALGO: Pachuca (1♀, MCZ); OAXACA: 50 km NW of Oaxaca, 97°00′W, 17°14′N, 6 August 1983 (2♀, MCZ).

Natural History. Beating oaks and pines in oak-pine area (3 records); sweeping shrubs, cloud forest (1 record). Elevations at four locations in Nuevo León and San Luis Potosí from 1,400 to 2,900 m.

8. *Pelegrina tristis* new species
Figures 197, 299–303; Map 7

Holotype male and paratype female in AMNH with labels "ARIZONA: Cochise Co., Round Park, Chiricahua Mtns., June 28, 1967. 9300 ft. [2,840 m], Gertsch, Hastings."

Etymology. Latin adjective for "sad," referring to the large size of the teardrop-shaped flaps over the epigynal openings.

Diagnosis. A large, dark, plainly marked species known from southern Arizona, similar in genitalia to *neoleonis* and *sabinema*. The erect portion of the embolus is broader than in either of those species, and the rami are sharper than in *neoleonis*. Females are generally not so yellow as in *sabinema*, and the epigynal openings are deeper, in that the surface descends more deeply under the anterior part of the flaps.

Male. Palpus (Figs. 197, 300): Embolus extremely broad, so that retrolateral margin joins without angle to retromargin of embolar base. Both rami sharply pointed; retrolateral ramus extended into long hook, lacking subterminal bump. *Markings* (Fig. 299): Carapace dark, with reduced forehead band. Cheek band very weak to absent. Clypeus brown, with dark hairs overhanging chelicerae. White forehead band absent or much reduced, fails to contact AMEs, which are ringed with dark above. Chelicerae lacking pale scales. Palpus almost uniformly brown, femur not distinctly paler. Cymbium lacking white scales. Legs relatively uniform brown, femora entirely dark. *Measurements:* Body length 3.7(4.3)4.6 mm; carapace length 1.8(2.1)2.1

mm, width/length 0.75(0.76)0.82; n = 4♂ from Chiricahua and Santa Catalina Mtns., Arizona.

Female. Epigynum (Figs. 301, 302): Flaps large, dark, and convergent, often far rotated, sometimes as far rotated as in *neoleonis* (Fig. 297). Just medial to the flap at the anterior end the surface is pale and descends deep under flap (Fig. 302, arrow). Except for this concavity, the epigynal surface is gently convex, highest medially behind flaps. First curve of duct very broad; second curve proceeds anteriorly. *Markings* (Fig. 303): Carapace covered above thinly with white to dark transparent reflective scales.Clypeus densely covered with white scales. Abdomen light to medium brown with small central pale spots. Narrow dark brown spots beside these pale spots form longitudinal dark stripes. *Measurements:* Body length 5.0(5.7)6.2 mm; carapace length 1.8(2.0)2.3 mm, width/length 0.77(0.78)0.82; n = 5♀ from Chiricahua, Huachuca, and Santa Rita Mtns., Arizona.

Male/Female Matching. This matching is indicated by microsympatry in Chiricahua Mtns., by robust embolus and flaps, by similar large size, and by similarity of genitalia to male and female of *sabinema*, which are reasonably surely matched.

Distribution (Map 7). Southern Arizona.

Records. UNITED STATES: ARIZONA: Santa Rita Mtns.: Madera Canyon (4♀, AMNH, MCZ); Huachuca Mtns.: Garden Canyon (1♀, AMNH); Santa Catalina Mtns.: Bear Wallow to Mt. Lemmon (1♀, AMNH), Chiricahua Mtns.: Round Park, Southwestern Research Station 8 km W of Portal, Barfoot Park, and Rustler's Park (3♂ 4♀, AMNH).

Natural History. Collected at 1,500–2,800 m elevation (3 records). Females have been collected in June (2 records), July (4 records), and August (3 records).

9. *Pelegrina sabinema* new species
Figures 198, 304–308; Map 9

Holotype male in AMNH with label "ARIZONA, Showlow, July 1967, W. J. Gertsch."

Etymology. An arbitrary combination of letters, to be treated as an adjective.

Notes on Specific Distinctness. Pelegrina sabinema is much like *pervaga*, and indeed I long considered it only the western form of *pervaga*, but the more strongly developed white-black-white carapace stripes and narrower embolus of *pervaga* suggest that *pervaga* may be the sister species to *kastoni*, with *sabinema* the sister to those two. The embolus and markings of *P. sabinema* are slightly more like those of *tristis* and *neoleonis*, which may be considered outgroups.

Diagnosis. Differs from *pervaga* in having less swollen carapace sides, an abdomen lacking the pale central stripe on the abdomen, wider embolus, weaker male cheek band, less dense band of dark hairs beneath male carapace side bands, darker and more robust epigynal flaps, and yellow female legs. Differs from *tristis* in having yellow legs, yellow male chelicerae, narrower embolus, dense covering of pale scales on female carapace, and shallower epigynal openings.

Male. Palpus (Figs. 198, 305): Embolus very wide at base of erect portion, thought still with a distinct angle between retromargins of erect portion and base; retrolateral ramus long and blunt. *Carapace* often broad though sides not swollen as in *pervaga*. *Markings* (Fig. 304): Cheek band weak, runs horizontally and posteriorly beneath band of dark hairs beneath white side bands. Clypeus brown, hairs overhanging chelicerae dark. White forehead band contacts AMEs rather far medially, from 9:00 to 12:00. Chelicerae yellow, lacking pale scales. Palpus yellow with white scales on femur, tibia and cymbium interrupted by dark hairs on patella and base of cymbium. Legs uniformly yellow. Abdomen brown centrally with white side bands, showing trace of paired dark spots of female. *Measurements:* Body length 3.3(3.6)3.8 mm; carapace length 1.7(1.7)1.9 mm, width/length 0.78(0.80)0.83; n = 5♂ from New Mexico and Arizona.

Female. Epigynum (Figs. 306, 307): Flaps flat and large, often far rotated, as in *tristis* and *neoleonis*, though usually not so dark as in those species. Openings shallower than in *tristis*; that is, just medial to the flap at the anterior end the surface is not so pale and does not dive deep under flap. Epigynal surface flat. First curve of duct very broad; second curve proceeds less anteriorly than in *tristis*. *Markings* (Fig. 308): Carapace well covered with white to yellowish scales. Clypeus very densely covered with white scales. Legs yellow. Abdomen yellowish with brown centrally, paired white spots. Usually paired dark brown spots in posterior half are beside white spots. *Measurements:* Body length 4.0(4.2)5.5 mm; carapace length 1.6(1.7–1.8)1.9 mm, width/length 0.78(0.80–0.81)0.86; n = 6♀ from New Mexico and Arizona.

Male/Female Matching. Male and females were matched by similar yellow color, by robust embolus and flaps, and by co-collecting and common distribution in New Mexico and northern Arizona, where no other unmatched females and males are known.

Distribution (Map 9). New Mexico, northern Arizona, southern Colorado, and western Texas.

Records. UNITED STATES: TEXAS: Jeff Davis Co.: 24 km NW of Fort Davis (1♀, AMNH); COLORADO: Montezuma Co.: Mesa Verde National Park (1♂, AMNH); NEW MEXICO: Bernalillo Co. (2♀, AMNH); Lincoln Co.: nr. Ruidoso, Ruidoso Cmpgd. (2♀, AMNH); Los Alamos Co.: nr. Los Alamos (1♀, AMNH); Sandoval Co.: (1♀, AMNH), Sandia Mtns., Juan Tabo area (2♀, AMNH); Santa Fe Co. (2♂ 1♀, AMNH), Glorieta Mesa nr. Rowe (1♂ 1♀, AMNH), 5 km N of Galiseo (1♂, AMNH), Route 66 just E of Edgewood (1♀, AMNH), 19 km S of Lamy (1♀, AMNH); Taos Co.: 27 km S of Taos (1♂ 1♀, AMNH); ARIZONA: Coconino Co.: Flagstaff (1♂ 1♀, UCB), Navajo Co.: Showlow (1♂, AMNH).

Natural History. Collected at 7,000 ft elevation (2 records), from pinyon pine-juniper (1 record).

10. *Pelegrina pervaga*
(G. & E. Peckham, 1909)
new combination

Figures 199, 240, 309–313; Map 10

Dendryphantes pervagus G. & E. Peckham, 1909: 474, pl. 37, figs. 9, 9a, ♀. Holotype in MCZ 1♀ with labels "Dendryphantes pervagus P., ♀ Wallace, Kansas type" (label is original; handwritten, probably by Elizabeth Peckham) and "G. W. Peckham Coll.", examined. Roewer, 1954: 1214.

Dendryphantes (Metaphidippus) prevagus [*sic*]:—Petrunkevitch, 1911: 640.

Metaphidippus pervagus:—Bonnet, 1957: 2817.

Diagnosis. A striking species with swollen carapace sides and central pale stripe on the abdomen in both sexes. Very similar to *sabinema*, from which it is distinguished by the features discussed under that species.

Male. Palpus (Figs. 199, 310); Embolus wide basally; retrolateral ramus long, pointing distally, having subterminal bump. *Carapace* sides swollen. *Markings* (Fig. 309): White carapace side band bordered below by narrow band of black hairs. Below this, the dense white cheek bands do not reach clypeus, which is dark. Hairs overhanging chelicerae dark. White forehead band contacts AMEs far medially, from 9:00 to 11:00. Chelicerae yellow, lacking pale scales. Palpus yellow, with white scales on end of femur, on tibia and cymbium, interrupted by dark hairs on patella. Legs light yellowish brown with some darker annulations. Abdomen with central longitudinal pale stripe as in female. *Measurements:* Body length 3.7(3.9)4.4 mm; carapace length 1.8(1.8)2.0 mm, width/length 0.83(0.85)0.88; n = 5♂ from Erath Co., Texas.

Female. Epigynum (Figs. 240, 311, 312): Flaps fairly large and flat, generally pale. Surface flat. First curve of duct wide; second curve proceeds obliquely anteriorly. *Markings* (Fig. 313): Carapace wide and covered with whitish scales. Clypeus covered densely with white scales. Abdomen with distinctive pale patch on middle of dorsum. *Measurements:* Body length 4.3(4.8)5.9 mm; carapace length 1.8(2.0)2.2 mm, width/length 0.80(0.82)0.85; n = 5♀ from Erath Co., Texas.

Distribution (Map 10). Texas, Oklahoma, and Kansas.

Records. UNITED STATES: KANSAS: Wallace Co.: Wallace (1♀, MCZ); OKLAHOMA: Commanche Co.: Visitor's Center, Wichita Mtns. (1♂, WPM); TEX-

AS: Erath Co.: 11 km NE of Stephenville (6♂ 7♀, TXAM).

Natural History. Collected from junipers in Texas (three records).

11. *Pelegrina kastoni* new species Figures 140, 141, 200, 314–318; Map 11

Metaphidippus n. sp. nr. *aeneolus:*—Jung and Roth, 1974: 33 (specimens identified by W. J. Gertsch, examined).

Holotype male and paratype female in MCZ with label "ARIZONA: Santa Cruz Co., Santa Rita Mtns., gate at 26 km of Whipple Obs[ervatory]. Rd. on Mt. Hopkins 7100 ft el. [2,170 m], 17 June 1985 W. Maddison 85-059, beating Cercocarpus and juniper."

Etymology. This beautiful species is named after the late B. J. Kaston, whose excellent work on the eastern species of *Pelegrina* added much to our understanding of the genus.

Diagnosis. The yellowish appendages and carapace stripes of males are similar to those of *pervaga* and *sabinema,* but the embolus and white bands on clypeus failing to meet at center are distinctive. The golden and beige females have distinctive epigynal flaps rotated 90° inward.

Male. Palpus. (Figs. 200, 315): Embolus rectangular but twisted at tip, relatively narrow, arising from retrolateral side of base. *Markings* (Figs. 140, 314): White carapace side band is bordered below by narrow band of black hairs, as in *pervaga.* Below this are thin, dense white cheek bands that extend across clypeus like Clark Gable moustache, broken in center. White forehead band either fails to contact AMEs, or at most contacts AMEs locally at 10:30–12:30. Chelicerae yellow, lacking pale scales. Palpus yellow, with markings much as *pervaga* and *sabinema,* with white scales on end of femur, on tibia and cymbium alternating with dark hairs on patella and base of cymbium. Legs yellow to light brown except first metatarsus distinctly darker, brown to black. *Measurements:* Body length 4.1(4.2)4.5 mm; carapace length 2.1(2.1)2.2 mm, width/length 0.79(0.80)0.83; n = 5♂ from Santa Rita Mtns., Arizona.

Female. Epigynum (Figs. 316, 317): Flaps rotated a full 90°, with deep openings just anterior to them, resting in pits, almost as in *Dendryphantes nigromaculatus* though flaps maintain their prominence as in other *Pelegrina.* Surface flat or slightly convex except for pits containing flaps. First curve of duct narrow and proceeding medially. *Markings* (Figs. 141, 318): Carapace wide, covered with yellowish scales. Clypeus densely covered with white scales. Legs light orange-brown. Abdomen brassy with beige markings. *Measurements:* Body length 4.9(5.2)6.5 mm; carapace length 2.1(2.3)2.4 mm, width/length 0.80(0.81) 0.83; n = 5♀ from Santa Rita Mtns., Arizona.

Male/Female Matching. The matching is indicated by extensive co-collecting on junipers in Arizona, by the wide carapace and yellowish color, and by the correlated retrolateral shift of the embolus and rotation of flaps.

Chromosomes. 2n♂ = 26? acrocentrics + XXO (1♂, Madera Canyon, Arizona).

Courtship (3♂ observed from Santa Rita Mountains, Arizona). The side-to-side waving of legs and palpi during crouch is distinctive. There is no clear distinction between raisedspread and crouch displays, but what may be *raisedspread* stage occurred as follows (n = 2, 2♂): First legs bowed and forward, tips apart (n = 1) to nearly touching (n = 3, 2♂), not moving (n = 3, 2♂). Palpi down (n = 3, 2♂), waving irregularly (n = 2, 1♂). *Crouch* (n = 9, 1♂): Body low (n = 8, 1♂) or at normal height (n = 1). First legs forward and bowed with tips touching, femora approximately horizontal but leg raised distally (n = 8, 1♂). First legs waving at very low amplitude very high frequency (n = 8, 1♂). Later, as he gets closer, the first legs are more parallel, and the first legs and palpi are waved slowly, ca. 1–2 c/s, all four first to right then to left (n = 1). Palpi when close (late crouch) held forward and waved left to right as noted above (n = 1). Abdomen twitching (n = 8, 1♂). *Repertoires:* 2♂

raisedspread or early crouch only; 1♂ crouch only.

Distribution (Map 11). Southern Arizona, southwestern New Mexico, and Chihuahua.

Records. UNITED STATES: ARIZONA: Santa Cruz Co.: Madera Canyon (6♂ 15♀, AMNH, MCZ), Mt. Hopkins (3♂ 5♀, MCZ), Sycamore Canyon W of Nogales (2♂ 2♀, MCZ), 29 km E of Nogales (1♀, AMNH); Cochise Co.: Chiricahua Mtns., Southwestern Research Station 8 km W of Portal (8♂ 5♀, AMNH), 5 km N or Portal (1♀, AMNH), Cave Creek Canyon (1♂, AMNH), Cienega Lake (1♀, AMNH), Huahucha Mtns., Garden Canyon (1♀, AMNH); Gila Co.: Tonto Creek Camp nr. Kahb's ranch (2♂ 1♀, AMNH). NEW MEXICO: Hidalgo Co.: Animas Valley (1♂, AMNH). *MEXICO:* Chihuahua (1♂, MCZ).

Natural History. Primarily found on juniper. In my collections (17–19 June 1985) from oak-juniper-pine woodlands in south-central Arizona, 9♂ 17♀ were beaten from junipers, 2♀ from oaks, and 1♂ 3♀ from Cercocarpus. Collected at elevations from 1,200 to 2,200 m. Most males collected in June (May—2 records, June—8, July—2, November—1); most females in June and July (June—7 records, July—5, August—2). Jung and Roth (1974) collected this species in their zone 2 in the Chiricahua Mountains (1,460–1,700 m elevation).

12. *Pelegrina flavipedes* (G. & E. Peckham, 1888) new combination

Figures 142, 143, 201, 241, 319–323, 338, 339; Map 12

Dendryphantes flavipedes G. & E. Peckham, 1888: 42, pl. 3, fig. 29a, ♂. Holotype in MCZ 1♂ with labels "Dendryphantes flavipedes Pkm, 1888. Canada. Type. ♂" (label is original; handwritten, probably by Elizabeth Peckham) and "G. W. Peckham Coll.", examined. G. & E. Peckham, 1909: 471, pl. 38, figs. 3, 3a–c, ♂♀. Roewer, 1954: 1210.

Dendryphantes (Metaphidippus) flavipedes:—Petrunkevitch, 1911: 630.

Metaphidippus flavipedes:—Chickering, 1944: 174, figs. 66–69, ♂♀. Bonnet, 1957: 2813. Kaston, 1973: 112, figs. 21–25, ♂♀.

The *flavipedes* group at first glance appears to consist of three easily distinguished species (Kaston, 1973): a striped species distributed across Canada (*flavipedes*), a yellow species with bulbous head in the northeastern United States (*flaviceps*), and a dark southern species (*exigua*). The situation is not nearly so simple as this, however, for hybridization may occur at the borders of their ranges (discussed under *flaviceps*) and two species may be confused under the name *exigua* (discussed under *exigua*).

Diagnosis. The handsomely striped yellow and brown males of *flavipedes* are distinguished from *flaviceps* and most *exigua* by the strong cheek band, three white spots above anterior eyes, narrow carapace, smaller medial black spot on the chelicerae, and lack of bulbous head. The striped form of *exigua* might be confused for *flavipedes* except by the much broader retrolateral ramus of the embolus of *flavipedes*. The females have a brassy sheen distinguishing them from other northern *Pelegrina*. *Pelegrina flavipedes* females differ from *flaviceps* females in being darker and having a narrower, more obliquely directed second curve of the epigynal ducts; they differ from *exigua* females in having more parallel epigynal flaps and a much narrower second curve of the epigynal ducts. See notes under *flaviceps* regarding possible hybridization.

Male. Palpus (Figs. 201, 320): Embolus divided deeply into two rami; prolateral ramus of embolus twisted at tip; retrolateral ramus thick. *Markings* (Figs. 142, 319): Carapace well marked with dense side band, wide, dense cheek band, and three patches of white scales on forehead, a large one between two AMEs and smaller ones between each AME and ALE. Because the forehead band contacts AMEs medially, the setae ringing the AMEs above are dark from 10:30 to 1:30. Clypeus with patch of white scales between AMEs; hairs overhanging chelicerae white medially brown laterally. Chelicerae yellow, with a small black spot medially. Femur of palpus through tibia yellow, contrasting with brown cymbium, which lacks white scales. Legs generally yellowish with more or less distinct longitudinal stripe on first femur; in a few specimens with stripes on all femora but not as thin as *flaviceps*. *Measure-*

ments: Body length 3.6(3.7)4.3 mm; carapace length 1.7(1.9)2.0 mm, width/length 0.74(0.76)0.79; n = 5♂ from Neepawa, Manitoba.

Female. Epigynum (Figs. 241, 321, 322): Flaps flat, parallel or only slightly convergent. Surface flat. First curve of duct broad; second curve narrow, beginning from posterior end of first curve and proceeding anteriorly toward the midline; flowerlike gland openings on dorsal face of duct. *Markings* (Figs. 143, 323): Carapace covered with transparent brown scales with a brassy sheen. Beige spots on forehead between and beside AMEs recall white spots of male and are usually stronger than in *exigua*. Setae directly above AMEs brown. Clypeus generally densely covered with white scales. Abdomen with brassy sheen and fourth pair of white spots formed into distinct chevron. *Measurements:* Body length 4.4(4.7)4.8 mm; carapace length 1.8(1.9)2.0 mm, width/length 0.74(0.77) 0.77; n = 5♀ from Neepawa, Manitoba.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ Nipigon, Ontario; 1♂ Edmonton, Alberta).

Courtship (4♂ observed from Edmonton, Alberta, and Neepawa, Manitoba). With unusual alternate waving of palpi during crouch display. *Raisedspread* (n = 1). *Crouch* (n = 7, 4♂): Body held at normal height (n = 5, 2♂) or somewhat raised (n = 1). First legs forward and horizontal (n = 2, 2♂) with tips raised (n = 1) or not (n = 1), or whole leg raised slightly (n = 5, 2♂). First legs apparently not waving (n = 2, 2♂). Palpi held down (n = 1) and somewhat forward (n = 2, 2♂). Palpi wave (n = 6, 3♂) up and down alternately (n = 5, 2♂), fairly slowly, on series (n = 1); specifically, palpi tips wave in small circles (n = 1), left clockwise and right counterclockwise or vice versa (n = 1). Abdomen twitches with low amplitude on series (n = 1). *Repertoires:* 3♂ crouch only; 1♂ raisedspread and crouch.

Distribution (Map 12). Across much of Canada and northeastern United States, south along the Rocky and Appalachian Mountains.

Records. Many specimens, especially in MCZ and AMNH, from: *CANADA:* NORTHWEST TERRITORIES: Mackenzie: Prelude Lake 113°55′W, 62°33′N; Lady Evelyn Falls 117°19′W, 60°57′N; NEWFOUNDLAND: Humber River; PRINCE EDWARD ISLAND: Tracadie; QUEBEC: Quebec City; NOVA SCOTIA: Weymouth, Barrington, Baddeck (Cape Breton), North Sydney; ONTARIO: Ottawa, Marten River 58 km N of North Bay, Parry Sound Dist.: 14 km S of Pte. Au Baril Station, Algoma Dist.: near Bruce Mines; Sudbury Dist.: Espanola; Thunder Bay Dist.: 7 km E of Nipigon; Kenora Dist.: Granite Lake; Lakefield, Chapleau, Sowerby, Lake Temagami, 56 km E of Hearst, Sioux Lookout, Gawas Bay, Kamiskotia Lake, Turkey Point, Moberly, Uxbridge, Spanish River, Iron Bridge, St. Williams, Batchawana, Nipigon, Dorset, L. Opeongo, Cababogie (Tweed), Haileybury, Pancake Bay nr. Batchawana, Emo, Fairbank Lake Province Park, Nestorville, Golden Lake, Minden, SouthTea Lake (Algonquin); MANITOBA: Kettle Rapids, Cedar Lake, Lyons Lake, 19 km E of Neepawa, Sandilands Provincial Forest; ALBERTA: Edmonton, Jasper, Banff, Athabasca Landing, Fitzgerald, North Lake Athabasca; BRITISH COLUMBIA: Wells Cray Park, Columbia Lake, Salmon Arm, Arrow Lakes. *UNITED STATES* (county records): MAINE: Aroostook, Penobscot, Piscataquis, Washington; NORTH CAROLINA: Avery, Buncombe; MICHIGAN: Allegan, Baraga, Calhoun, Charlevoix, Cheboygan, Chippewa, Crawford, Delta, Emmett, Grand Traverse, Ingham, Mackinac, Marquette, Oakland, Washtenaw; WISCONSIN: Chippewa, Lincoln; ILLINOIS: Lake; MINNESOTA: Clearwater, Hennepin; MONTANA: Jefferson, Ravalli, Sanders; IDAHO: Fremont; WYOMING: Crook, Lincoln, Park, Teton; COLORADO: Archuleta, Boulder, Gilpin; NEW MEXICO: Sandoval, San Miguel, Taos; WASHINGTON: Okanagan, Stevens.

Natural History. A conifer dweller, collected from spruce (11 records from Ontario, Manitoba, and Alberta), including white spruce (2 records); pines (4 records from Ontario, British Columbia, and Michigan), including lodgepole pine (1 record) and jackpine (1 record); junipers (3 records from Ontario); and larch (2 records from Ontario and Illinois).

13. *Pelegrina flaviceps* (Kaston, 1973) new combination

Figures 144, 145, 202, 242, 324–328, 340, 341; Map 13

Metaphidippus flaviceps Kaston, 1973: 110, figs. 15–20, ♂♀. Holotype ♂ and paratype ♀ in AMNH with labels "Holotype ♂ + allotype ♀, Metaphidippus flaviceps n.sp., det by B. J. Kaston (1949)" and

"Clarendon, Vt., 2 Sept. 1939, E. M. Greenspan," examined. Brignoli, 1983: 643.

Notes on Specific Distinctness. Apparent hybridization between this species and the other two in the group makes their separation doubtful. Males from northern Massachusetts (Pepperell, Groton, East Templeton), southern New Hampshire (Hollis), and Ithaca, New York, show grades of intermediacy between *exigua* and *flaviceps.* Of 25 males collected at one site in Pepperell, 9 have dark legs and a flat cephalic area (as in *exigua* farther south), 10 have dark legs and a bulbous cephalic area, 1 has yellow legs and a flat cephalic area, and 5 have yellow legs and a bulbous cephalic area (as in *flaviceps* farther north). At this site, even those with yellow legs and bulbous carapace have a wider carapace than is usual for *flaviceps.* Courtship behavior of the apparent hybrids from Pepperell appears like that of *flaviceps* and *exigua* (3♂ observed). In Michigan and Maine, on the northern edge of the range of *flaviceps,* males otherwise like *flavipedes* have been found with the bulbous cephalic area.

Diagnosis. Males can be distinguished from those of *flavipedes* and *exigua* by the bulbous cephalic area, dark lateral spots on the chelicerae (Fig. 324), carapace dusted with pale scales (Fig. 144), and pale yellow legs. Females can be difficult to distinguish from those of *flavipedes* and *exigua*; they are generally paler, lack white spots on the forehead, often have narrow dark lines on the femora, and may have the cephalic area slightly swollen. The epigynal flaps and ducts are intermediate between those of *flavipedes* and *exigua.* The medial black spot on the chelicerae is much more distinct in *flaviceps* females than in *flavipedes* females.

Male. Palpus (Figs. 202, 325): Embolus divided deeply into two rami; prolateral ramus of embolus not as twisted as in *exigua. Carapace* is swollen dorsally in cephalic area; carapace narrowest of group, especially at front. *Markings* (Figs. 144, 324): Carapace and abdomen dusted with pale scales, so as to make side bands indistinct. Lacks white spots on forehead. Cephalic area appears yellow in alcohol, though may be dark in life (Fig. 144) and is covered with small dark hairs. Cheek band dense and wide. Clypeus brown, hairs overhanging chelicerae dark. Setae surrounding AMEs brown to light brown entirely. Chelicerae yellow with long, deep, dark black spot medially, and brown spot laterally near the base. Just lateral to the medial black spot the surface is flat to slightly concave. Palpus light brown throughout, cymbium not noticeably darker. Cymbium lacks white scales. Legs pale yellow with thin black prolateral longitudinal stripe on all femora except sometimes lacking on posterior legs. First leg with fringe of white hairs. *Measurements:* Body length 3.7(3.8)3.8 mm; carapace length 1.8(1.8)1.9 mm, width/length 0.72(0.73)0.74; n = 5♂ from Sagadahoc Co., Maine.

Female. Epigynum (Figs. 326, 327, 340, 341): Flaps parallel to convergent. Epigynal surface flat. First curve of duct broad, not so long as in *flavipedes*; second curve broader and more medially directed than in *flavipedes,* though not nearly so broad as in *exigua*; flowerlike gland openings on dorsal face of duct. *Carapace:* Sometimes with swollen cephalic area. *Markings* (Fig. 328): Carapace uniformly dark on forehead, lacking patches of pale scales behind anterior eyes. Clypeus densely covered with white scales. Chelicerae with prominent medial black spot reminiscent of males. Some females with thin longitudinal lines on leg femora. Abdomen usually indistinctly marked, sometimes with dark areas formed into longitudinal bands on either side of middle paler area. *Measurements:* Body length 3.7(4.0)4.6 mm; carapace length 1.7(1.8)1.9 mm, width/length 0.74(0.74)0.75; n = 5♀ from Sagadahoc Co., Maine, and Durham, New Hampshire.

Courtship (4♂ observed from Reid State Park, Maine). With unusual alternate circling of palpi during crouch stage. *Raised-spread* (n = 2, 2♂): continued until 2 or 3 body lengths from female when male went into crouch stage (n = 2, 2♂). *Crouch* (n =

10, 4♂): Body held high (n = 6, 2♂) or low (n = 1). First legs forward and bowed (n = 5, 3♂), tips close (n = 2, 1♂); legs move more parallel as he gets close (n = 1). Femur low but raised distally (n = 5, 3♂), or legs may be horizontal and lower than body (n = 4, 1♂). Palpi down and forward (n = 3, 1♂). Palpi flicker (n = 9, 4♂) for few seconds (n = 4, 3♂), then pause for few seconds (n = 3, 2♂). Flicker–pause cycle repeats (n = 5, 3♂), 3–4 (n = 1) or more than 8 times (n = 1). Palpus flicker is of low amplitude and high frequency (n = 2, 2♂) and is superimposed on larger up and down slightly circular wave; right palpus moving up as left down and vice versa (n = 2, 2♂). Abdomen twitched occasionally (n = 9, 4♂) when palpi flickered (n = 5, 3♂). For much of display, male stood without walking, thought when he did palpi and abdomen were flickered during series (n = 1) and during pause (n = 3, 2♂). Once, male proceeded to mount after about 3–4 palpus flicker cycles of crouch (n = 1). *Repertoires:* 2♂ crouch only; 2♂ raised-spread and crouch.

Distribution (Map 13). Northeastern United States and southeastern Canada.

Records. Over 100♂ 100♀ in AMNH and MCZ from: *CANADA:* QUEBEC: Lake Champlain; ONTARIO: Toronto, Newmarket, Ottawa. *UNITED STATES* (county records): MAINE: Cumberland, Hancock, Penobscot, Sagadahoc, Waldo; NEW HAMPSHIRE: Carroll, Cheshire, Coos, Grafton, Strafford; VERMONT: Caledonia, Rutland, Windham; NEW YORK: Albany, Cortland, Essex, Franklin, Greene, Hamilton, Lewis, Nassau, Oneida, Onondaga, Schoharie, Steuben, Tompkins, Yates; PENNSYLVANIA: Pike; WEST VIRGINIA: Preston; MICHIGAN: Charlevoix, Kalkaska.

Natural History. A conifer dweller, collected from spruce (2 records), junipers and pine (1 record), spruces, firs, and pine (1 record), and hemlocks (1 record).

14. *Pelegrina exigua* (Banks, 1892) new combination
Figures 127, 146–149, 203, 243, 329–337, 342; Map 14

Dendryphantes exiguus Banks, 1892: 75, pl. 5, fig. 30, ♀. Holotype in MCZ 1♀ with labels "Dendryphantes exiguus Bks type," "Ithaca, N.Y.," and "Nathan Banks Coll.", examined. Roewer, 1954: 1209.

Dendryphantes virginis Chamberlin, 1925a: 233. Type material said to be in MCZ by Chamberlin but no holotype found therein. Paratypes from Woodridge, District of Columbia (3♂ 1♀), Bladenburg, Maryland (2♂), examined. Bonnet, 1956: 1402.

Metaphidippus virginis:—Muma, 1944: 11.

Metaphidippus exiguus:—Kaston, 1945: 10. Kaston, 1973: 112, figs. 26–29, ♂♀.

Metaphidippus flavipedes:—Bonnet, 1957: 2813.

Notes on Synonymy. The holotype female of *D. exiguus* is peculiar in having the palpus tarsi swollen, as in antepenultimate instar males, yet has a well-developed epigynum. There is doubt as to the placement of this specimen, for the epigynum is much more like that of *flaviceps* than of southern species that has been called *exiguus,* with the flowerlike glands on the face of the duct, not hidden by a fold, and the duct not nearly so broad (Fig. 342) as is usual in the southern species. However, the markings of the type are like those of the southern species (white scales between anterior eyes on forehead, no stripes on legs, wide carapace, abdominal markings more uniformly dark). Males collected from Ithaca, New York (including a male in the MCZ with a Bryant label indicating that it was collected with Banks's female type of *exiguus*), are in most respects like *exigua* but have a head bump like *flaviceps.* It therefore appears that the type locality of *exigua* is along the hybrid zone with *flaviceps* (see notes under *flaviceps*). Specimens of pure *flaviceps* occur in towns near Ithaca. Until variation at the type locality is better understood, Kaston's application of the name *exigua* to the southern species will be maintained.

To further complicate the application of the name *exigua,* two distinct color forms are found in the south that may very well represent distinct species. The typical (dull) form (Figs. 146–147, 329, 333) is more uniformly dark in carapace and appendages; the striped form (Figs. 148, 149, 334, 335) has much more extensive white markings and distinct markings on the legs. The two forms appear perfectly discrete: all undamaged specimens are easily sorted to one or the other. However, no clear differences in genitalia have been found, both forms having the embolus and spermathecae as considered diagnostic for *exigua*. The spermathecal ducts may be more convoluted in the dull form, but an adequate and convincing characterization of any difference has proved elusive. The only convincing structural difference so far noted is in the width of the dark depression on the inner margin of the male's chelicera. The one striped male observed had a courtship display as in dull males, to the level of detail observed. Only the dull form has been seen from some coastal states (New York, New Jersey, North Carolina), while only the striped form has been seen from Missouri and Illinois. However, the two forms occur sympatrically in Virginia, Maryland, and Arkansas. In Virginia and Maryland, they have even been caught from conifer trees in the same field. In Massachusetts, there is variation in the amount of white markings but the variation does not appear to sort itself into two discrete forms. Until stronger evidence is available to separate the forms, they will be kept under the name *P. exigua*. The name *D. exiguus* and apparently also *D. virginis* apply to the dull form. In the following description the markings of the two forms will be described separately.

Diagnosis. Males of *exigua* can be distinguished from *flavipedes* and *flaviceps* by the mostly dark brown legs, the thin retrolateral ramus (Chamberlin, 1925a), and the more twisted prolateral ramus. The black spot on the chelicerae is much broader than in *flavipedes*. Females of *exigua* have more strongly convergent epigynal flaps and an extremely broad second curve of the internal ducts.

Male. Palpus (Figs. 203, 330): Embolus divided deeply into two rami; retrolateral ramus thinner than prolateral; prolateral ramus strongly twisted. *Markings: Dull form* (Figs. 146, 329): Carapace relatively dark, area above first eye row brown. Cheek band much reduced, to streak beside ALEs. Clypeus brown, hairs overhanging chelicerae dark. Setae surrounding AMEs white laterally 2:00–4:00, often medially 9:00–10:00; brown otherwise. Chelicerae yellow with front surface slightly concave and with black patch on inner margin shorter than in *flaviceps* but nonetheless deep, distinct, and wide; chelicera lacks prominent basal lateral brown spot. Palpus brown, basal segments not distinctly paler. Patella, tibia, and cymbium lack white scales. Legs more or less uniformly dark, without distinct longitudinal lines. Abdomen dorsum brown, with weak side bands. *Striped form* (Figs. 148, 334): Carapace with white spots between eyes of anterior eye row as in *flavipedes*. Cheek band thin but long. Clypeus with patch of white scales between AMEs, hairs overhanging chelicerae white centrally and dark laterally. Setae surrounding AMEs white laterally 2:00–4:00, medially 7:00–11:00; brown otherwise. Chelicerae yellow with black depression on inner margin narrower than in dull form. Basal segments of palpus paler than cymbium. Palpus femur, patella, and tibia with white scales; cymbium lacking white scales. First leg femur and patella dark ventrally but with white scales dorsally; tibia mostly dark especially on anterior surface. Other legs pale with dark markings. Abdomen dorsum dark brown, with strong white side bands. *Measurements:* Body length 4.4(4.5)4.9 mm; carapace length 1.9(2.0)2.2 mm, width/length 0.81(0.84)0.84; n = 5♂ from Massachusetts, Maryland, Virginia, Kentucky, and North Carolina.

Female. Epigynum (Figs. 243, 331, 332, 336, 337, 342): Flaps convergent, posteriorly at about 45° rotation. Epigynal surface flat. Ducts most notable for the very broad second curve such that the anterior edge of this curve begins near anterior end of flap; flowerlike gland openings along anterior edge of curve. *Markings: Dull form* (Figs. 147, 333): Carapace brown, covered with transparent brown scales except for some beige to white scales. Like *flavipedes,* there are patches of pale scales behind and between eyes of anterior row;

scales surrounding AMEs dark dorsally. Clypeus densely covered with white scales. Abdomen almost uniform brown, with chevrons not so distinct as in *flavipedes. Striped form* (Figs. 149, 335): Carapace often darker than in dull form, covered with transparent brown scales except for some beige to white scales. Behind and between anterior eyes are patches of pale scales; scales surrounding AMEs dark dorsally. Clypeus densely covered with white scales. Legs pale with some dark markings; first tibia dark as in males. Abdomen dark centrally, with contrasting pale side bands. *Measurements:* Body length 5.3(5.7)5.8 mm; carapace length 2.0(2.1)2.2 mm, width/length 0.79(0.80)0.82; n = 5♀ (dull form) from Rowan Co., Kentucky.

Courtship (7♂ observed from Shenandoah Co., Virginia; Caroline and Montgomery Counties, Maryland; all dull form except one ♂ striped from Montgomery Co.). With unusual alternate waving of palpi during crouch display. *Raisedspread* (n = 16, 7♂). *Crouch* (n = 10, 5♂): Body low (n = 3, 2♂) or raised (n = 1). Male walks in series with long pauses during which palpi are waved (n = 1), or walk is more or less continuous with constant palpus and leg waving and abdomen twitching (n = 2, 1♂). First legs forward and parallel (n = 9, 4♂), slightly bowed (n = 2, 2♂) or stretched forward (n = 7, 3♂), with tips almost touching (n = 3, 2♂) or not (n = 2, 1♂). First legs horizontal (n = 2, 1♂: apparently in intense display), or slightly raised (n = 6, 3♂), to ca. 30° (n = 2, 2♂). Tips of first legs moved side to side (both same direction) during leg waving (n = 5, 3♂), in phase with palpus waving (n = 1). Palpi forward (n = 3, 3♂) and down (n = 1) or slightly raised (n = 2, 2♂). Palpi waved alternately (n = 5, 3♂) up and down (n = 5, 3♂) several times at about 2 left and 2 right palpus waves per second for 2–5 sec (n = 1). Abdomen twitched (n = 3, 2♂) while palpi waved (n = 2, 2♂). *Repertoires:* 2♂ raisedspread only; 5♂ raisedspread and crouch.

Distribution (Map 14). Eastern United States except for far north.

Records. Many specimens, especially in MCZ and AMNH, from: *UNITED STATES* (county records): *Dull form:* MASSACHUSETTS: Barnstable, Essex; CONNECTICUT: Fairfield, New Haven; NEW YORK: Nassau, Suffolk, Tompkins; NEW JERSEY: Burlington, Hunterdon, Ocean; WEST VIRGINIA: Jefferson; VIRGINIA: Augusta, Bedford, Brunswick, Essex, Fairfax, Norfolk, Page, Shenandoah, Washington; MARYLAND: Caroline, Montgomery, Prince Georges; DISTRICT OF COLUMBIA: Woodridge; KENTUCKY: Rowan; TENNESSEE: Unicoi; NORTH CAROLINA: Burke, Craven, Durham, Rockingham; SOUTH CAROLINA: Oconee; GEORGIA: Thomas; ALABAMA: DeKalb, Tuscaloosa; MISSISSIPPI: Scott; ARKANSAS: Bradley, Calhoun; TEXAS: San Augustine. *Striped form:* VIRGINIA: Augusta, Essex, Washington; MARYLAND: Georges, Montgomery; ALABAMA: Madison; ILLINOIS: Hardin; MISSOURI: Boone, Cole; ARKANSAS: Washington. *Form not distinguished:* MASSACHUSETTS: Barnstable, Essex, Middlesex, Norfolk, Suffolk.

Natural History. Usually found on conifers, known from pines (8 records), junipers (8 records), occasionally on other plants such as oak (1 record) and walnut (2 records).

15. *Pelegrina montana* (Emerton, 1891) new combination
Figures 1, 154, 204, 244, 343–347; Map 16

Dendryphantes montanus Emerton, 1891: 11. Types in MCZ 2♂ 2♀ with labels "Dendryphantes montanus [underlined in red], Mt. Washington, N. H." and "J. H. Emerton Coll.", examined. G. & E. Peckham, 1909: 459, pl. 37, figs. 4, 4a–c, ♂♀. Roewer, 1954: 1213. Bonnet, 1956: 1396.

Dendryphantes (Metaphidippus) montanus:—Petrunkevitch, 1911: 636.

Metaphidippus montanus:—Chickering and Bacorn, 1933: 526. Kaston, 1973: 115, figs. 37, 38, ♂♀.

Diagnosis. A large, dark northern and montane species. The embolus that expands near tip and the rough epigynum with ridges behind the flaps are diagnostic.

Male. Palpus (Figs. 204, 344): Embolus narrow near base and flares at tip, almost spoon-shaped, concave dorsally. Retrolateral ramus reduced. Small denticles cover the embolus surface basally. *Markings* (Figs. 1, 154, 343): Carapace with diffuse white side band and white forehead band. Cheek band very weak to absent. Clypeus brown; hairs overhanging chelicerae dark. White forehead band contacts AMEs dorsally 10:30–1:00. Chelicerae lacking pale scales. Cymbium lacking white scales. Abdomen more or less uniformly dark dorsally, much darker than *insignis*; anterior white spots absent and posterior reduced to thin lateral bars. *Measurements:* Body length 4.1(4.6)5.3 mm; carapace length 2.0(2.1)2.5 mm, width/length 0.74(0.80) 0.82; n = 5♂ from Colorado, Vermont, New Hampshire, and Quebec.

Female. Epigynum (Figs. 244, 345, 346): Flaps short, convex, parallel or divergent. Most distinctive are the small but conspicuous ridges (seen as dark streaks in Fig. 346) immediately behind and lateral to flaps. Surface not raised into a bulge posteriorly. Notch usually deep, sometimes longer than flaps, often shaped like a rounded rectangle. First curve of duct very narrow; second curve proceeds obliquely posteriorly unlike most other members of genus. *Markings* (Fig. 347): Carapace dark, thinly to sparsely covered with white scales. Clypeus densely covered with white scales. Abdominal dorsum largely brown, medially slightly paler, with only small paired white spots, without black spots; white laterally. *Measurements:* Body length 5.5(5.9–6.9)7.1 mm; carapace length 2.4(2.5)2.7 mm, width/length 0.75(0.78) 0.79; n = 5♀ from Colorado, Vermont, and New Hampshire.

Courtship (1♂ observed from Butte, Montana). *Crouch* (n = 6): Body low (n = 4). First legs horizontal (n = 4) and parallel (n = 4); not waving (n = 6). Palpi tucked in to side (n = 4), down (n = 2); waved slightly (n = 6). Abdomen twitching occasionally (n = 6).

Distribution (Map 16). Newfoundland west to British Columbia, Yukon Territory south to Colorado in the west and New Hampshire and New York in the east. Kaston's (1973) report of a record from Illinois is probably based on a pair of *insignis* from Urbana in the AMNH identified by him in 1949 as *montana*; the male has the tip of both emboli broken (see Cutler, 1979) and thus resembles *montana*.

Records. Most in MCZ, from: *CANADA:* YUKON: Tklo-Klut, 10 km E Old Crow (1♂ 4♀), King Edward range N of Old Crow (1♂); NEWFOUNDLAND: Indian River (2♂ 1♀), Terra Nova National Park (1♂); QUEBEC: Anticosti, Fox Bay (2♂ 1♀), Lake Mistassini, Ayikwapit Peninsula (1♂); MANITOBA: Cedar Lake (1♂ 1♀), H. B. Railway 214 (1♂); ALBERTA: Edmonton (1♀), Waterton Lakes National Park, nr. Waterton Lake (1♂, WPM), Jasper (1♀); BRITISH COLUMBIA: Pink Mountain (3♀), Muskeg nr. Little Prairie (2♀). *UNITED STATES* (county records): NEW HAMPSHIRE: Chesire (1♂), Coos (2♂ 3♀); VERMONT: Chittenden (1♂ 2♀); NEW YORK: Cattaraugus (2♂, AMNH), Essex (1♂ 1♀, AMNH), Greene (2♂, AMNH); VIRGINIA: Giles (1♀); MONTANA: Beaverhead (3♀), Glacier (1♀), Jefferson (1♀), Park (1♀); IDAHO: Custer (1♂ 4♀), Franklin (1♀); WYOMING: Albany (1♀), Teton (1♂ 3♀); COLORADO: Boulder (6♀), Custer (1♂), Grand (1♂), Gunnison (1♂), Larimer (1♂); UTAH: Uinta (1♀), Wasatch (1♀); NEW MEXICO: Bernalillo (1♀); ALASKA: Shaw Creek, mile 289 Richardson Hwy (1♂).

Natural History. From birch, willow, poplar, and other deciduous bushes and trees beside streams and rivers and in bogs in British Columbia, Yukon, Montana (4 records). In aspen-lodgepole pine meadow in Colorado (1 records). In Yukon below 450 m elevation (1 record), Montana and Idaho 1,800–2,000 m (2 records), Colorado, Utah, and Wyoming 2,400–2,900 m (9 records).

16. *Pelegrina insignis* (Banks, 1892) new combination

Figures 128, 150, 151, 205, 245, 348–353; Map 17

Dendryphantes insignis Banks, 1892:74, pl. 5, figs. 28, 28a, ♀. Holotype in MCZ 1♀ with labels "Dendryphantes insignis Bks type," "Ithaca, N. Y.," and "Nathan Banks Coll.", examined.

Metaphidippus montanus:—Chickering, 1944: 176, figs. 70–73, ♂♀.

Metaphidippus octavus:—Kaston, 1945: 10.

Metaphidippus insignis:—Kaston, 1948: 476, figs. 1750–1752, ♂♀. Kaston, 1973: 114, figs. 34–36, ♂♀. Cutler, 1979: 279–274.

Dendryphantes capitatus:—Roewer, 1954: 1202.

Metaphidippus clematus:—Levi and Levi, 1951, in part: 232, possibly figure 39 (paratype series includes *insignis* females).

Metaphidippus capitatus:—Bonnet, 1957: 2810, in part.

Notes on Synonymy. The specimen cited above may be labeled incorrectly as holotype, for Banks's description and figures seem to depict females of *proterva* because of the white pubescence (not yellow as in what we now call "*insignis*"), the red-ringed leg segments (not uniformly yellowish), the large reddish spots on the abdomen (not smaller and black), and the long, parallel epigynal flaps (not short and divergent). Nonetheless, since the specimen marked holotype is clearly of the species we now call "*insignis,*" it seems best to leave the matter as it stands and presume that Banks was somewhat erroneous in this description.

Diagnosis. Notable for the yellowish markings with strong black spots on the abdomen. *Pelegrina montana* and *clemata* are similar but the long spatulate embolus and epigynal topography of *insignis* are distinctive.

Male. Palpus (Figs. 205, 349, 350): Embolus flares slightly in distal half; usually bent slightly toward the retrolateral. Retrolateral ramus reduced. The tip of the embolus is very thin and sometimes partially or entirely broken off (see Cutler, 1979). Small denticles cover the embolus surface basal to opening. *Markings* (Figs. 150, 348): Carapace often suffused with brassy scales dorsally, with patches of white between the fovea and posterior eyes in addition to ample white side bands and V mark behind AMEs. Cheek band weak. Clypeus brown; hairs overhanging chelicerae dark. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with small patch of yellowish scales medially near base. Palpus femur covered with white scales; more distal segments darker and usually without white scales. Cymbium with none to a few white scales. Abdomen shows paired black spots of female; anterior paired medial white spots distinct; brassy sheen medially. *Measurements:* Body length 3.4(3.6)4.1 mm; carapace length 1.7(1.8)2.1 mm, width/length 0.77(0.77)0.79; n = 5♂ from New Brunswick, Massachusetts, Minnesota, and Saskatchewan.

Female. Epigynum (Figs. 245, 351, 352): Flaps short and divergent or parallel. Surface behind flaps raised into bulge only medially and posteriorly, so that surface rises gradually behind flaps, or if surface rises abruptly it does so at some distance behind flaps. Posterior bulge often considerably higher than level of flaps. Notch triangular and sharp. First curve of duct narrow; second curve proceeds obliquely posteriorly or medially. *Markings* (Figs. 151, 353): Carapace covered densely with yellowish white scales. Clypeus densely covered with yellow scales. Legs more or less uniformly yellow. Abdomen dorsum with prominent paired black spots, otherwise yellow-brown to red-brown with paired spots and lateral markings of yellow and white scales. *Measurements:* Body length 3.8(4.1)5.3 mm; carapace length 1.7(1.9)2.1 mm, width/length 0.74(0.78) 0.79; n = 5♀ from Saskatchewan and Minnesota.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ from Taber, Alberta).

Courtship (2♂ observed from Taber, Alberta, and North Battleford, Saskatchewan). With triangular leg position during crouch display. *Raisedspread* (n = 1). *Crouch* (Fig. 128; n = 8, 2♂): Body at low (n = 5, 1♂) to normal (n = 3, 1♂) height. First legs horizontal and forward (n = 8, 2♂), spread slightly (n = 3, 1♂) or bowed with tips close (n = 5, 1♂). First legs extended forward on series and waved slightly; on pauses, first legs held back so as to form a roughly triangular shape as in *verecunda* and *aeneola* (n = 5, 1♂), though the leading leg is sometimes held in during series (n = 3, 1♂). Palpi down (n = 8, 2♂) and tucked in (n = 5, 1♂); waved up and down (n = 8, 2♂), on series (n = 5, 1♂). *Repertoires:* 1♂ crouch only; 1♂ raisedspread and crouch.

Distribution (Map 17). New Brunswick west to Alberta, south to New York and Colorado.

Records. In AMNH, MCZ, and WPM from: *CANADA:* NEW BRUNSWICK: nr. Chipman; ONTARIO: Barrie; 5 km S of Richmond near Ottawa; Cambridge; SASKATCHEWAN: Wells Lake nr. Alberta border; North Battleford; Estevan; ALBERTA: Islay; 8 km W of Writing-on-Stone Provincial Park; Medicine Hat; betw. Cereal and Oyen; Taber. *UNITED STATES* (county records): MAINE: Hancock, Lincoln; VERMONT: Windham; MASSACHUSETTS: Middlesex, Norfolk, Worcester; CONNECTICUT: Fairfield, Hartford, New Haven, New London, Tolland; NEW YORK: Seneca, Tompkins; NEW JERSEY: Bergen, Ocean; MICHIGAN: Hillsdale, Ingham, Lenawee, Midland, Oakland; WISCONSIN: Dane; ILLINOIS: Champaign; MINNESOTA: Hennepin, Olmsted, Polk, Ramsey; IOWA: Boone; NORTH DAKOTA: Burleigh, Nelson, Ransom; COLORADO: Fremont.

Natural History. On *Chamaedaphne*, *Betula*, and other vegetation in bogs in New Brunswick and Ontario; in oldfields and prairies in Ontario, Alberta, Minnesota, and Wisconsin. In an open habitat in North Battleford, Saskatchewan, *P. proterva* was common and restricted to the taller shrubs (taller than 1 m), whereas *P.insignis* was common and restricted to the short shrubs (shorter than 0.5 m) among the grasses. In habitats in Alberta and Massachusetts, *P. insignis* has also been found on short shrubs and herbs. In late June near Templeton, Massachusetts, numerous females were found with egg sacs in nests in living but curled leaves of goldenrod and other herbs.

17. *Pelegrina chaimona* new species
Figures 206, 354–358; Map 18

Metaphidippus n. sp. nr. *verecundus:*—Jung and Roth, 1974: 33 (specimens identified by W. J. Gertsch, examined).

Holotype male in AMNH with label "ARIZONA: 5 mi [8 km] W of Portal, Cochise County, SWRS [Southwestern Research Station], June 9, 1968, V. Roth."

Etymology. An arbitrary combination of letters, to be treated as an adjective.

Diagnosis. Male closely resembles *P. montana*, but erect portion of embolus is more or less parallel-sided. The embolus is shorter and stouter than that of *insignis* and has a distinct retrolateral ramus. The embolus bears some resemblance to that of *dithalea*, but the rami are closer together (Figs. 206, 192). The female of *chaimona* is poorly known.

Male. Palpus (Figs. 206, 355): Embolus rectangular, widening gradually to base on retromargin so that there is no distinct angle between erect portion and base. Rami small and not much separated. Erect portion of embolus arises more retrolaterally than in *dithalea*. Embolus surface with small denticles basally. *Markings* (Fig. 354): Cheek band generally weak. Clypeus brown; hairs overhanging chelicerae dark except white medially. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with small medial patch of white scales. Cymbium with none to a few white scales. *Measurements:* Body length 3.9(4.1–4.2)4.3 mm; carapace length 1.6(2.0)2.1 mm, width/length 0.77(0.78) 0.80; n = 5♂ from Chiricahua Mtns., Arizona.

Female. Epigynum (Figs. 356, 357): Flaps fairly short, convergent or parallel. Surface raised just inside flaps midway along their length; behind flaps surface low, rises into prominent mound posteriorly. First curve of duct narrow; second curve proceeds medially. *Markings* (Fig. 358): Carapace with white scales dorsally. Clypeus densely covered with white scales. Abdomen pale laterally and dark centrally with paired white spots. *Measurements:* Body length 4.6, 5.0, 54. mm; carapace length 1.8, 1.8, 2.1 mm, width/length 0.78, 0.78, 0.79; n = 3♀ from Arizona and Chihuahua.

Male/Female Matching. With the females of *chalceola*, *dithalea*, and *kastoni* well associated with males, there remain two males (*chaimona* and *huachuca*) and two females unmatched in southern Arizona. The matching of these is in doubt, but the following evidence supports the matching of the females described above with the male of *chaimona*: the flaps of the female are of typical robustness, as would be expected to match the embolus of *chaimona*; the first curve of the epigynal duct is narrow like the related *in-*

signis and *montana*; the cephalic plate is somewhat rugose as in males; these females have only been found in extreme eastern Arizona and south, as have the males.

Distribution (Map 18). Southeastern Arizona, Chihuahua, and Nuevo León.

Records. UNITED STATES: ARIZONA: Cochise Co.: Chiricahua Mtns.: Southwestern Research Station 8 km W of Portal (7♂ 1♀, AMNH), Cottonwood Creek, Rucker Canyon (1♂, AMNH), Cave Creek Canyon (1♂, AMNH). *MÉXICO:* CHIHUAHUA: Primavera (1♂, AMNH), San Jose Babicora (2♂, AMNH), summit NE of San Jose Babicora (1♀, AMNH), Madera (1♀, AMNH); NUEVO LEÓN: Cerro Potosí (1♂, MCZ).

Natural History. Collected from *Chrysothamnus* (1♂) and sweeping herbs (1♂) at elevations from 1,650 to 3,200 m. Males collected in May (1♂), June (6♂), July (3♂); females collected in July (3♀). Jung and Roth (1974) collected this species in their zone 2 in the Chiricahua Mountains (1,460–1,700 m elevation).

18. *Pelegrina clemata*
(Levi & Levi, 1951) new combination
Figures 152, 153, 207, 246, 359–364; Map 19

Metaphidippus clematus Levi and Levi, 1951: 232, figs. 37, 39, 40, 42 (fig. 39 may be *insignis*), ♂♀. Holotype ♂ and paratype ♀ in AMNH with label "Metaphidippus clematus Levi ♀ ♂, ♂ holotype ♀ allotype, Medicine Hat, Alta., Aug. Carr," examined.
Dendryphantes clematus:—Roewer, 1954: 1209.

Diagnosis. Markings whitish instead of yellow distinguish it from *insignis.* Embolus narrower at tip than in *montana, insignis, chaimona,* and *dithalea,* much as in *baila* and *chalceola,* though these have different markings and a wider carapace than *clemata.* The tegulum's prominent bulge is unusual. The dark epigynum with a prominent shiny mound behind the flaps is distinctive.

Male. Palpus (Figs. 207, 360, 361): Erect portion of embolus straight, tapering or of equal width from base to tip, with small rami at tip; prolateral ramus is more prominent than retrolateral ramus, which is small and not projecting retrolaterally. Embolus lacks the spoonlike dorsal concavity present in the *montana* group. Tegulum swollen prolaterally into prominent bump. *Markings* (Figs. 152, 359): Carapace with white side bands and white V mark behind AMEs; sometimes with a weak marginal white band. Cheek band weak. Clypeus brown; hairs overhanging chelicerae dark. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae occasionally with a few white scales medially. Palpus femur and distal segments including cymbium all with at least some white scales. Abdomen without central paired white spots; some males show paired black spots. *Measurements:* Body length 3.8(4.0)4.2 mm; carapace length 1.9(2.0)2.2 mm, width/length 0.76(0.77) 0.79; n = 5♂ from Outlook, Saskatchewan.

Female. Epigynum (Figs. 246, 362, 363): Dark and shiny. Flaps convergent. Entire area behind flaps raised into a bulge, so that surface rises abruptly behind flaps. Notch triangular or rounded and short, often only half the length of flaps. First curve of duct narrow; second curve goes medially. *Markings* (Figs. 153, 364): Carapace covered with white scales. Clypeus densely covered with white scales. Abdomen dorsum brown with white paired spots and lateral markings; usually with paired black spots, though not so distinct as *insignis.* The first three pairs of white spots may be joined to form two longitudinal bands. *Measurements:* Body length 4.7(5.8)5.8 mm; carapace length 1.9(2.1)2.1 mm, width/length 0.73(0.76)0.79; n = 5♀ from Outlook, Saskatchewan.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ from Richfield, Utah).

Courtship (14♂ observed from Outlook, Saskatchewan; Morrin, Alberta; and Piute Co., Utah). *Raisedspread* (n = 21, 11♂). *Crouch* (n = 29, 9♂): Body at normal height (n = 8, 3♂) to low (n = 2, 1♂). First legs forward and horizontal (n = 15, 7♂) or slightly raised (n = 8, 3♂), or raised to 45° with femur low (n = 3, 2♂); nearly parallel (n = 5, 2♂), or spread fairly wide (n = 4, 2♂). First legs not waved (n = 11, 4♂). Palpi down (n = 23, 8♂) and beside chelicerae (n = 3, 1♂) or curled under (n = 5, 1♂); flickered during series (n = 23, 8♂), vigorously (n = 5, 1♂) up and down (n = 4, 2♂), still on pause (n = 4, 2♂). Abdomen twitched (n = 15, 5♂) during series (n = 9, 3♂), or perhaps at end of series (n = 3, 1♂), still on pause (n = 4, 2♂); twitched continuously when walking to mount (n = 1). *Repertoires:* 3♂ raisedspread only; 2♂ crouch only; 8♂ raisedspread and crouch.

Distribution (Map 19). Western Canada and United States.

Records. In MCZ, AMNH, UWBM, MSU, and WPM from: *CANADA:* SASKATCHEWAN: Outlook; ALBERTA: Medicine Hat; Morrin Recreation Area on Red Deer River; BRITISH COLUMBIA: Bull River, ca. 115.5° W, 49.5° N; Cranbrook. *UNITED STATES* (county records): MONTANA: Sanders; WYOMING: Carbon, Lincoln, Park, Sheridan, Teton; COLORADO: Dolores, Gunnison, Huerfano, Lake, Larimer, Saguache; UTAH: Box Elder, Cache, Millard, Piute, Rich, Sevier, Summit, Utah, Weber; IDAHO: Bear Lake, Blaine, Canyon, Cassia, Fremont, Gem, Oneida, Payette; NEVADA: Elko; NEW MEXICO: Taos; WASHINGTON: Grant, Kittitas, Yakima; OREGON: Baker, Deschutes, Grant, Harney, Malheur; CALIFORNIA: Contra Costa, Eldorado, Los Angeles, Mono, Placer, Sierra, Siskiyou.

Natural History. From sagebrush (*Artemisia*) in Washington, Oregon, Colorado, Utah, and Wyoming (10 records). Also taken from field vegetation (Washington), *Purshia* (Oregon), *Chrysothamnus* (California), *Haplopappus*, and *Sarcobatus* (Utah), 1 record each.

19. *Pelegrina aeneola* (Curtis, 1892) new combination

Figures 156, 157, 208, 209, 247, 365–377; Map 21

Dendryphantes aeneolus Curtis, 1892: 332. Types in MCZ 3♂, 6♀ with labels "Dendryphantes aeneolus Curtis 1892. California. Co-type. ♂ ♀" (label is original; handwritten, probably by Elizabeth Peckham) and "G. W. Peckham Coll.", examined. Curtis (1892: 335) implies that the type locality is the San Francisco Bay area. G. & E. Peckham, 1909: 468, pl. 36, figs. 1–1b, and pl. 38, 6, 6a, ♂♀. Roewer, 1954: 1205.

Dendryphantes bifida Banks, 1895: 96. Types in MCZ 2♀, 3 p♂ with labels "Dendryphantes bifida Bks. type", "Olympia, Wash" and "Nathan Banks Coll.", examined. This type series is incomplete, for Banks described the adult male.

Dendryphantes (*Metaphidippus*) *aeneolus:*—Petrunkevitch, 1911: 622.

Dendryphantes uteanus Chamberlin and Gertsch, 1929: 110, figs. 50, 51, ♂. Holotype in AMNH 1♂ with labels "Dendryphantes uteanus, ♂ holotype," "Metaphidippus aeneolus (Curtis), ♂ w111.n40, HOLOTYPE Dendryphantes uteanus Chamb. & Gert.", "Utah: Lamb's Can 6-10-28 W. J. G.", and "28Ff. N40:W111," examined. Roewer, 1954: 1216. Bonnet, 1956: 1402. NEW SYNONYMY.

Metaphidippus aeneolus:—Chamberlin and Ivie, 1941: 26. Bonnet, 1957: 2809.

Diagnosis. A common species of the western United States and Canada. Males are notable for their dark markings, with reduced white scales on the carapace. The rami of the embolus are more widely separated than in *clemata*, *balia*, or *chalceola*. Females can be identified by carapace and abdominal markings, the epigynal topography and angled flaps. The epigynal surface rises more abruptly behind the flaps than in *balia*, but not so raised in a bulge as in *insignis* or *clemata*. The epigynal flaps are much more robust than in the sympatric *Metaphidippus mannii*, from which *aeneola* also differs in markings, including having white scales between AMEs.

Male. Palpus (Figs. 208, 209, 366–372): Embolus leaning toward the retrolateral, broadest at tip; two rami widely separated. *Markings* (Figs. 156, 365): Carapace dark and shiny, with few or no white scales except beneath ALEs and small eyes (occasional ♂♂ have white side bands, though usually sparse). Clypeus brown; hairs overhanging chelicerae dark brown. Forehead band absent; setae ringing AMEs white at least laterally 2:00–3:00; otherwise, thin scales brown to white. Chelicerae lack pale scales. Cymbium lacking white scales. Abdomen dark; white side bands often faint or absent posteriorly. *Measurements:* Body length 4.2(4.3)4.7 mm; carapace length 2.0(2.1)2.2 mm, width/length 0.75(0.79) 0.81; n = 7♂ from Oregon, Nevada, and Utah.

Female. Epigynum (Figs. 247, 373–376): Flap with inner edge angled where the posterior half of flap bends down into depression. Surface rises abruptly, almost immediately posterior to the flaps, but posterior portion of epigynum is fairly flat. Notch often triangular with a sharp anterior point, but many ♀♀ have rounded notch. First curve of duct narrow; second curve proceeds medially. *Markings* (Figs. 157, 377): Carapace only thinly covered with white scales; bronze scales also especially on cephalic plate. Most females with inverted T marking on cephalic plate consisting of white band of scales starting between AMEs, proceeding posteriorly, then spreading laterally to behind small eyes. Otherwise, bronze behind AMEs and ALEs, and bronze between posterior eyes. Clypeus densely covered with white scales, paler between AMEs than in *balia* and *mannii,* which have orange scales. Abdomen white markings usually small except often large central pale spot. Background dark, often bronze or gray, occasionally with paired dark spots on either side of the midline.*Measurements:* Body length 4.5(4.8)6.1 mm; carapace length 2.0(2.1)2.3 mm, width/length 0.77(0.79)0.85; n = 7♀ from Oregon and Arizona.

Geographical Variation. In western ♂♂ (*aeneola* proper, British Columbia, Washington, Oregon, California), embolus narrow with prolateral face gently curved or slightly bent (Fig. 208); in eastern ♂♂ (form *uteanus,* South Dakota, Montana, Wyoming, Colorado, Utah, New Mexico, Arizona), embolus is wider with prominent angle on prolateral face just basal to the opening, and rami more divergent (Fig. 209). The few specimens available from the intermediate area (Idaho, Nevada, and southeastern California) and occasional specimens from Oregon show some intergradation. No other differences in ♂♂ and none in ♀♀ have been found between western and eastern populations; hence, I consider them conspecific. ♂♂ from the Columbia basin of Washington, some from southern California, and occasional males from Oregon and northern California have extensive but not very dense white side bands on the carapace.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (2♂ from Apple Canyon, Riverside Co., California).

Courtship (9♂ observed from Yakima and Kittitas Counties, Washington, and Riverside Co., California). First legs make triangular shape during crouch display, as in *P. verecunda. Raisedspread* (n = 21, 5♂). *Crouch* (n = 22, 8♂): Body low (n = 6, 3♂). First legs horizontal (n = 17, 7♂) but femora held back and to sides and distal segments pointed forward and with tarsi nearly touching so as to make a triangle shape (n = 12, 5♂), though occasionally femora held forward and tips not touching (n = 3, 1♂). First legs flickered on series (n = 9, 4♂), but only slightly (n = 3, 1♂) or not waved (n = 7, 3♂); also flickered when very close (n = 6, 4♂) at which time legs extended (n = 4, 3♂). Palpi tucked in (n = 6, 2♂), flickering on series (n = 6, 2♂) or when male very close (n = 2, 2♂). *Repertoires:* 1♂ raisedspread only; 4♂ crouch only; 4♂ raisedspread and crouch.

Distribution (Map 21). Western United States, extending into Canada and México.

Records. Many specimens, especially in MCZ, AMNH, UWBM, and UCB, from: *CANADA:* BRITISH COLUMBIA: Alice Lake Province Park; Creston; Furry Creek; Massett; Victoria; Wellington, Qualicum, Nanaimo; ALBERTA: Waterton Lakes National Park. *UNITED STATES* (county records): SOUTH DAKOTA: Custer, Horsethief, Jackson, Pennington; MONTANA: Flathead, Lewis and Clark, Park; IDAHO: Bear Lake, Boise, Bonner, Franklin, Latah, Oneida, Payette, Washington; WYOMING: Sheridan; COLORADO: Alamosa, Custer, Douglas, Fremont, Hinsdale, Juab, La Plata, Larimer, Logan, Montezuma, Utah; UTAH: Box Elder, Cache, Davis, Grand, Juab, Piute, Salt Lake, Uinta, Weber; NEVADA: Washoe; NEW MEXICO: Bernalillo, Lincoln, Otero, Rio Arriba, Sandoval, San Miguel, Santa Fe, Taos, Torrance, Valencia; ARIZONA: Apache, Cochise, Coconino, Graham, Mohave, Yavapai; WASHINGTON: Asotin, Chelan, Clallam, Columbia, Douglas, Grant, Grays Harbor, Jefferson, King, Kittitas, Pierce, San Juan, Skagit, Skamania, Snohomish, Stevens, Thurston, Walla Walla, Yakima; OREGON: Benton, Deschutes, Douglas, Grant, Harney, Jackson, Jefferson, Josephine, Klamath, Lake, Lane, Marion, Multinomah, Umatilla, Union, Wallowa; CALIFORNIA: Alameda, Contra Costa, El Dorado, Kern, Lassen, Los Angeles, Marin, Mendocino, Modoc, Monterey, Nevada, Orange, Plumas, Riverside, San Bernardino, San Diego, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Santa Cruz Island, Shasta, Sierra, Siskiyou, Trinity, Tulare, Ventura, Yuba. *MÉXICO:* BAJA CALIFORNIA DEL NORTE: Parque Nacional Sierra San Pedro Martin.

Natural History. Habitat: In Washington, collected from pines including *Pinus ponderosa*, understory of riparian poplar woodland, understory ferns, *Ceanothus*, alders in bog, lakeside marsh, houses; at elevations of less than 50 m to more than 1,700 m. More than 15 adults males and females were recovered by D. H. Mann and others on snow at 1,700–3,000 m, apparently having ballooned (Pierce Co., Washington). In Oregon, commonly collected from *Abies grandis* and *Pinus ponderosa*; also from *Pseudotsuga*, *Picea*, *Pinus contorta*, hemlock, alder, *Salix*, bracken fern, *Calocedrus*, *Taxus*, oak, *Ceanothus*, and *Larix occidentalis*. Curtis (1892) reported it common in San Francisco area gardens on honeysuckle, rose bushes, live oaks, and *Laurestina*. In Nevada, beating pinyon pine; in Arizona on pine. *Life cycle:* In Oregon's Malheur National Forest, B. Fichter and A. Moldenke collected 44♂ 77♀ from 12 to 17 June 1982, 6♂ 25♀ from 18 to 23 July 1982, and 81♀ from 20 to 29 September 1982. In the San Francisco area, "males and females appear as adults as early as April, but the former become rare after the first of June and the latter after the first of September. The females begin laying eggs in May" (Curtis, 1892: 335). Curtis reported one or two egg sacs per females with about 50 eggs that hatched on average in 25 days. In Los Angeles County, California, the 20♂♂ examined by me were collected from November through June; the 21♀♀ from February through June plus two in September. *Behavior:* Curtis (1892) described the spider's entrance to and defense of its retreat, its ballooning, and its reaction to a sluggish pet lizard. Land (1969a, b, 1971) investigated visual behavior and eye structure and function of *P. aeneola*.

20. *Pelegrina balia* new species
Figures 210, 248, 378–382; Map 20

Holotype male and paratype female in UCB with label "CA[lifornia]: S[an]ta. Barbara Co., Ballinger Cyn., 17 mi. [27 km] SE. New Cuyama, el. 3000′ [915 m], V-9-1980, C. E. Griswold."

Etymology. After the Greek adjective *balios*, meaning "dappled" (Woods, 1966).

Diagnosis. A large western species with light brown and beige markings. The male can be identified by the broad side bands of the carapace and the flange on the fang. The embolus is narrow, very similar to that of *chalceola*, but it leans slightly and the erect portion broadens gradually into base. The tibial apophysis of *balia* usually points more distally than in *chalceola*. The female can be identified by the spotted abdomen and the epigynum, which differs from that of the sympatric *aeneola* in having the surface rise gradually behind the flaps.

Male. Palpus (Figs. 210, 379): Embolus narrow and tall, leaning slightly to retrolateral; erect portion broadens gradually into base. Retrolateral ramus points retrolaterally. Retrolateral edge of embolic base with membranous fold, unlike *chalceola*. *Chelicerae* robust and divergent; fang with pronounced flange on cutting edge (Fig. 378, arrow). *Markings* (Fig. 378): unlike most other *Pelegrina* males in having markings more spotted than striped. Carapace with distinctive, broad creamy white side bands. Cheek band weak and broad. Clypeus brown; hairs overhanging chelicerae dark with some white medially. White forehead band fails to contact AMEs dorsally, which are ringed by dark or at most thin white setae. Chelicerae lacking pale scales. Cymbium lacking white scales. Abdomen either mottled as in female, with conspicuous basal band and second lateral bar, or with side spots fused into very wide cream side bands. *Measurements:* Body length 3.8(4.3)5.1 mm; carapace length 1.8(2.1–2.3)2.3 mm, width/length 0.79 (0.81–0.82)0.85; n = 6♂ from California, Oregon, and Washington.

Female. Epigynum (Figs. 248, 380, 381): Flaps usually light brown, convergent, though sometimes dark. Epigynal surface mostly concave except or bump just medial to flaps; surface rises behind flaps gradually to a medial and posterior bulge. First curve of duct pale; second curve goes medially; third curve smooth on inner surface. *Markings* (Fig. 382): Carapace covered densely with yellow-white scales, often with dark streak on thorax side. Clypeus densely covered with white, between AMEs orange or tan (white in some Oregon ♀♀). Abdomen mottled with large pale spots: with pale basal band fused to first lateral bar; second oblique bar swollen; posterior lateral bars inconspicuous; central pale spots round, edge or connected with dark brown. *Measurements:* Body length 4.7(5.2)6.1 mm; carapace length 2.1(2.2)2.3 mm, width/length 0.79(0.80) 0.81; n = 5♀ from California.

Male/Female Matching. This matching is indicated by the similarity in robust carapace and mottled markings and by cocollecting.

Distribution (Map 20). California, north to Washington and east to Arizona and Colorado.

Records. About 70 specimens in AMNH, UCB, and MCZ from: *UNITED STATES* (county records): WASHINGTON: Spokane; OREGON: Baker, Deschutes, Harney, Jackson, Klamath, Lane, Wheeler; CALIFORNIA: El Dorado, Fresno, Inyo, Kern, Lassen, Los Angeles, Mariposa, Mendocino, Modoc, Mono, Plumas, Riverside, San Bernardino, Santa Barbara, Shasta, Siskiyou, Sonoma, Stanislaus, Trinity, Ventura; COLORADO: Mesa; ARIZONA: Yavapai.

Natural History. On *Juniperus occidentalis* (3 records), *Pseudotsuga* (2 records), *Cupressus macnabiana* (1 record), *Abies* (1 record), and *Calocedrus* (1 record) in Oregon and northern California. From juniper woodland in California (5 records). Over the entire range, 3♂ were collected in April, 10 in May, 3 in June and 1 in September.

21. *Pelegrina chalceola* new species
Figures 139, 211, 383–387; Map 20

Metaphidippus n. sp. nr. *montanus:*—Jung and Roth, 1974: 33 (specimens identified by W. J. Gertsch, examined).

Holotype male and several immatures in MCZ with label "ARIZONA: Santa Cruz Co., upper Madera Canyon, Santa Rita Mtns., ca. 5500 ft [1,680 m]. 13 Aug 1983. W. Maddison 83-158 oak woodland, beating oaks."

Etymology. An arbitrary combination of letters designed to resemble the name of the similar species *P. aeneola* both in structure and in referring to the bronze color (Greek, *chalceos*).

Diagnosis. A dark, shiny southwestern species resembling *aeneola* and *balia*. The narrow, tall embolus is much like that of *balia*, from which *chalceola* differs by the lack of the pronounced flange on the male fang, and the much darker body with a bronze sheen in both males and females.

Male. Palpus (Figs. 211, 384): Erect portion of embolus narrow and tall, straight, usually broadens abruptly into embolic base so as to leave angle between erect portion and base. Retrolateral ramus points retrolaterally. Retrolateral edge of embolic base is simple and schlerotized, lacking the fold seen in *balia*. *Markings* (Figs. 139, 383): Carapace dark, with narrow white side bands often reduced behind posterior eyes. Cephalic area with transparent bronze scales. Forehead lacks white band, though in some males there is small patch of pale scales between and behind AMEs. Cheek band weak to almost absent. Clypeus brown; hairs overhanging chelicerae white centrally and tan laterally, to all brown. Setae ringing AMEs brown dorsally. Chelicerae robust but vertical, with none to a few pale scales medially. Cymbium lacking pale scales. Third leg dark on distal ⅔ to entirely dark. Abdomen dorsally brown with paired black spots and thin white side bands; third and fourth pairs of white spots when present are laterally directed bars. *Measurements:* Body length 3.9(4.0)4.9 mm; carapace length 1.8(2.1)2.3 mm, width/length 0.80(0.82) 0.83; n = 5♂ from Arizona.

Female. Epigynum (Figs. 385, 386): Flaps short, slightly convergent, posteriorly in concavity. Epigynal surface gently convex behind flaps. Second curve of duct goes medially; third curve with rough inner surface. *Markings* (Fig. 387): Brown with bronze sheen. Carapace covered with reflective white to tan scales. Spots of pale scales between anterior eyes similar to *fla-*

vipedes. Clypeus densely covered with white scales. AME eye ring darkest dorsally, tan to brown, as in male. Abdomen with large paired dark spots. *Measurements:* Body length 4.4, 4.4, 4.7, 4.7 mm; carapace length 2.1, 2.2, 2.3, 2.3 mm, width/length 0.78, 0.78, 0.81; n = 4♀ from Arizona.

Male/Female Matching. Among Arizonan species, the female and male share a distinctive wide box-shaped carapace, dark bronzed appearance, and markings on abdomen. The AME ring dark above and light elsewhere also unites male and female. The underside of the abdomen is also fairly pale, distinguishing it from the female of *huachuca.*

Geographical Variation. Two male *Pelegrina* from Durango tentatively identified as *chalceola* differ from specimens from the United States in being large (body length 5.2,5.2 mm; carapace length 2.5,2.5 mm, width/length 0.82,0.83), with embolus shorter and leaning more to the retrolateral in the distal half, and with a bump on the side of the chelicera almost as in the *mannii* group but not so well developed.

Courtship (1♂ observed from Madera Canyon, Arizona). *Raisedspread* (n = 6): Carapace high (n = 6); abdomen down (n = 6) and trailing (n = 2). First legs raised, forward, spread (n = 6), but legs moved to more parallel as he got closer (n = 4), waved little if at all (n = 6). Palpi down, waving little if at all (n = 6). Male proceeded directly from raisedspread to reaching to touch the female, without going through a crouch display (n = 4).

Distribution (Map 20). Southern Arizona east to southern Illinois.

Records. *UNITED STATES:* ARIZONA: Cochise Co.: Chiricahua Mtns., Southwestern Research Station (8♂, AMNH); Chiricahua Mtns. (1♀, AMNH); Huachuca Mtns., Montezuma Pass (1♂, AMNH); Santa Cruz Co.: Santa Rita Mtns., Madera Canyon (1♂, MCZ; 1♂, AMNH), Santa Rita Mtns. (2♀, AMNH); TEXAS: Denton Co.: Lake Dallas opposite Hatchery (1♂, MCZ); Erath Co.: Stephenville (3♂, TXAM); ARKANSAS: Washington Co.: Boston Mtns., Cove Creek Valley, 24 km S of Prairie Grove (1♂, MCZ); ILLINOIS: Hardin (♀).

Natural History. Collected beating oaks in oak woodland (1♂, Arizona) and from juniper (1♂, Texas) at altitudes from 300 m (Arkansas) to 1,650 m (Arizona). Jung and Roth (1974) collected this species in their zones 1 and 2 in the Chiricahua Mountains (1,200–1,700 m).

22. *Pelegrina furcata* (F. P.-Cambridge, 1901) new combination

Figures 158, 159, 212, 249, 250, 388–402; Map 22

Metaphidippus furcatus F.P.-Cambridge, 1901: 267, pl. 24, figs. 8, 8a, ♂. Type material in BMNH 2♂ with label "Dendryphantes furcatus, sp. n. m's, Orizaba, Mexico (H. S.)" and 2♂ with label "Dendryphantes furcatus, sp. n. Type ♂, Syntype ♂., Guatemala (Sarg)," examined. Despite the type label on the latter specimens, the holotype may be better considered to be among the former, given Cambridge's indication of the distribution as Orizaba. Bonnet, 1957: 2813.

Dendryphantes furcatus:—G. & E. Peckham, 1909: 473. Roewer, 1954: 1203.

Dendryphantes mimus Chamberlin, 1925b: 135, figs. 53, 54, ♂. Holotype in MCZ 1♂ with label "Dendryphantes mimus Chamb., ♂ holotype, N. M.: Pecos, R. V. Chamberlin Coll. 1047," examined. Roewer, 1954: 1212. Bonnet, 1956: 1396. NEW SYNONYMY.

Diagnosis. A species common in the Mexican highlands, with a striking courtship display and distinctive embolus having two blunt rami. The epigynum, with convex flaps, concave surface, and wide second curve of the ducts, is distinctive.

Male. Palpus (Figs. 212, 389–394): Embolus heavy and slanting, with retrolateral ramus extended and truncate. *Markings* (Figs. 158, 88): dark brown with distinct sheen and contrasting white side bands. Carapace side bands usually connect to white scales over anterior eye row to make a continuous band of white encircling the front of the carapace (though not seen in male drawn, Fig. 388). Cheek band moderately weak. Clypeus brown; hairs overhanging chelicerae brown to white medially, brown laterally. White forehead band contacts AMEs dorsally 10:30–12:30 or 1:00. Chelicerae with some pale scales medially. Cymbium lacking pale scales. *Measurements:* Southern Arizona: Body length 3.5(4.2)4.5 mm; carapace length 1.7(2.1)2.2 mm, width/length 0.74(0.77) 0.77; n = 5♂ from Santa Rita Mtns., Arizona. Northern Arizona: body length 3.5, 3.6, 3.9 mm; carapace length 1.7, 1.8, 1.8 mm, width/length 0.75, 0.78, 0.79; n = 3♂ from Yavapai Co., Arizona.

Female. Epigynum (Figs. 249, 250, 395, 397, 398, 400, 401): Flaps strongly convex and often dark. Surface concave behind flaps, without mound, rising gradually to lip at back edge. First curve of duct narrow; second curve broad initially but narrows as it proceeds medially. *Markings* (Figs. 159, 396, 399, 402): Body often with slight bronze sheen; variable in markings. Carapace covered with brassy reflective scales, sometimes dark, sometimes mixed with white. Clypeus only thinly covered with white scales except in northernmost populations (form *mimus*). *Measurements:* Southern Arizona: Body length 4.5(4.7–4.9)5.4 mm; carapace length 2.0(2.1)2.2 mm, width/length 0.75(0.78–0.79)0.79; n = 6♀ from Santa Rita Mtns., Arizona. Northern Arizona: Body length 4.0(4.6)5.7 mm; carapace length 1.8(1.8)2.0 mm, width/length 0.72(0.75)0.77; n = 5♀ from Yavapai Co., Arizona.

Geographical Variation. Four geographical forms might be recognized. (1) The most widespread form occurs from Guatemala north to northern México, with narrower embolus and thinner epigynal flaps that are divergent or parallel (*furcata s.s.*,; Fig. 393). The retrolateral ramus of the embolus is truncated obliquely. Most females through this range are well marked with pale spots, as in form *mimus* (Fig. 396). (2) A second form, very similar to the widespread form, occurs in the Santa Rita, Santa Catalina, and Chiricahua Mountains of southern Arizona and probably in northern México (Figs. 392, 397–399). The embolus is also narrow and the flaps divergent or parallel, but the retrolateral ramus of the embolus is truncated transversely, so that its distal tip makes a line perpendicular to the axis of the palpus. Females are dark. (3) A third form occurs in northern Arizona (Yavapai Co.), Colorado, and New Mexico, having a wider embolus and convergent flaps (*mimus*: Figs. 390, 391, 395, 396). The retrolateral ramus of the embolus is truncated transversely, as in form (2). The difference between the northern (*mimus*) and southern (*furcata*) Arizona specimens is rather striking, for the females are also smaller and paler in the north. Though *mimus* might be considered a distinct species, specimens in New Mexico present a confusing mixture of characteristics of forms (1), (2), and (3). (4) A fourth form is found in western Oaxaca (4♂ 15♀, 31 km N or Guelatao de Juarez, ca. 96.5°W, 17.5°N, 2,600 m el., 3 August 1983, W. Maddison & R. S. Anderson, MCZ), with very wide embolus, dark females, and extremely robust flaps (Figs. 388, 400–402).This form occurs within 50 km of the widespread form. In total, the variation among these populations is confusing, and though several species may be present, only one will be recognized until better studied.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (2♂ from Madera Canyon, Arizona).

Courtship (10♂ observed from Nuevo León, Hidalgo, Queretaro, Puebla, Oaxaca, Chiapas, and the Santa Rita Mountains of Arizona). Very unusual for the genus, with vigorous leg waving and body jerking in a stage I will call the semaphore stage. *Semaphore* (n = 24, 10♂): Body high to very high (n = 24, 10♂). Male walked sidling (n = 19, 8♂) in series (n = 14, 5♂). First legs wide, nearly 180° apart, approximately horizontal (n = 21, 8♂) or below horizontal (n = 1), though occasionally not much more than 90° apart and raised to 60° (n = 1), waved vigorously up and down almost to vertical (n = 21, 9♂), though sometimes only to ca. 40° (n = 1), at ca. 3–4 c/s (n = 2, 2♂) or 5 c/s (n = 1) on each sidle (n = 9, 4♂). The leg wave is vertical and slightly posterior to bring the legs up and back (n =7, 4♂); the left and right sides wave in unison (n = 4, 3♂), or occasionally asynchronously (n = 1). Palpi hanging down (n = 18, 8♂) and parallel (n = 9, 4♂) and a bit forward (n = 7, 3♂). Palpi wave with low-medium amplitude (n = 5, 3♂) on each sidle (n = 4, 2♂), up and down like pushing and pulling motion (n = 1), or largely still (n = 1, 2♂). Abdomen trails a bit on sidles (n = 5, 2♂), ca. 10–30° (n = 3, 1♂), but more or less horizontal (n = 16, 5♂). Occasionally ♂ pauses from vigorous leg waving and jerks whole body (n = 11, 6♂) approximately 4–5 times (n = 3, 3♂) or 3 times (n = 1) while the first legs are spread wide and horizontal (n = 11, 6♂). These jerks came after a few sidles (n = 1). The body may be lowered for the jerks (n = 1). *Reach* (n = 3, 2♂): The male proceeded directly from this semaphore stage into the reach to touch the female (n = 3, 2♂). During reach, body jerked a few times (n = 1). First legs held parallel and forward (n = 2, 2♂). Palpi held parallel and forward (n = 2, 2♂).

This description is from the widespread form (1) with the following exceptions. Displays of 4♂ from the distinctive population from Guelatao de Juarez, Oaxaca (form (4)), showed the same form of semaphore display with legs spread wide, vigorously waved up during series (n = 11, 4♂). No whole-body jerks were noted, however. One male from southern Arizona (form (2)) showed the same semaphore display (n = 4), though no whole-body jerks were noted.

Distribution (Map 22). Throughout the highlands of México, extending north to Colorado and south to Guatemala.

Records. Mostly in MCZ and AMNH: *UNITED STATES* (county records): COLORADO: Boulder (4♂), El Paso (1♂), Rio Grande (1♂); NEW MEXICO: Bernalillo (1♂ 3♀), Catron (1♂), Colfax (2♂ 1♀), Grant (1♂), Lincoln (3♂ 4♀), Los Alamos (1♂), Mora (2♀), Otero (1♂ 2♀), Sandoval (1♂ 2♀), San Miguel (1♂), Santa Fe (1♂), Socorro (2♂), Valencia (1♂ 3♀); ARIZONA: Cochise (more than 15 ♂ 9♀), Santa Cruz (18♂ 17♀), Graham (1♀), Pima (3♂ 2♀), Yavapai (5♂ 8♀). *MÉXICO:* NUEVO LEÓN: Cerro Potosí (2♂ 4♀); Monterery (1♂); CHIHUAHUA: Canon Prieta, near Primavera (1♀); HIDALGO: 4 km NE of Tlanchinol (2♂ 6♀); 3.4 km SW of Cuesta Colorada (4♂ 2♀); 10 km SW of Santa María, 99°00′W, 21°06′N (1♂); 8 km N of Encarnacion, 99.12°W, 20.55°N (2♀); Huachinango (1♀); Apulco (1♂ 2♀); Champuhuacan (1♀); Maguey Verde, 99.12°W, 20.49°N; PUEBLA: 8 km N of Teziutlan (1♂ 3♀); near Xicotepec de Juarez, 97°59′W, 20°17′N (1♂) 5 km N of Hwy 130 on road to Naupan (1♂); QUERETARO: ca. 99°10′W, 21°15′N (5♂ 3♀); GUERRERO: Chilapa (1♀); VERACRUZ: 3 km N of Fortin de las Flores (1♂); 6 km NE of Coscomatepec (2♂); 7 km N of Huatusco (1♂ 3♀); Orizaba (♂♂♀♀); DISTRITO FEDERAL: Santa Rose (1♂), Contreras (1♂); OAXACA: 23 km SW of Valle Nacional on Hwy 175 (4♂ 5♀); 27 km SW of Valle Nacional on Hwy 175 (1♂ 2♀); 31 km N of Guelatao de Juarez (4♂ 15♀); CHIAPAS: 5 km W of San Cristóbal de las Casas (3♂ 3♀); Grutas de San Cristóbal (1♀); San Cristóbal (4♂ 4♀). *GUATEMALA:* locality unknown (2♂).

Natural History. Collected from oak (7 records), grasses, herbs, and shrubs in clearings (5 records), pine (3 records), juniper (1 record), *Ceanothus* (1 record), *Cercocarpus* (1 record), in oak-pine cloud forest zones. Collected at elevations of 1,000–1,400 m (8 records, 1,500–2,000 m (7 records), and 2,100–3,000 m (7 records).

23. *Pelegrina volcana* new species
Figures 213, 403, 404; Map 23

Holotype male in MCZ with labels: "PANAMA: El Volcán, A. M Chickering" and "R. P. El Volcán, Aug. 9–14, 1950."

Etymology. An arbitrary combination of letters referring to the type locality, to be treated as an adjective.

Diagnosis. Known from only two males from Panamá; much like *bicuspidata* but the long embolus is not so bent as in that species.

Male. Palpus (Figs. 213, 404): Erect portion of embolus broadens gradually into base; rami small and subequal. Tibial apophysis appears double because ridge prolonged into second apophysis, more extreme than in *furcata* (Fig. 389). *Markings* (Fig. 403): Typical for genus with carapace side bands, forehead band. Cheek band dense. Clypeus brown; hairs overhanging chelicerae white medially and brown laterally. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with long medial patch running almost at least ⅔ length. Palpus femur distinctly paler than more distal segments. Cymbium with none or few white scales. Legs fairly distinctly annulate. Anterior three pairs of abdominal spots longitudinally directed, 4 through 6 transverse. Strong abdominal side bands. *Measurements:* Body length 3.5, 3.7 mm; carapace length 1.7, 1.8 mm, width/length 0.76, 0.77; n = 2♂ from Panamá.

24. *Pelegrina bicuspidata*
(F. P.-Cambridge, 1901)
new combination
Figures 214, 405, 406; Map 23

Metaphidippus bicuspidatus F. P.-Cambridge, 1901: 269, pl. 24, figs. 13, 13a, b, ♂. Holotype in BMNH 1♂ with labels "Dendryphantes bicuspidatus, sp. Type ♂, Guatemala (Sarg)" and "1905, 268.", examined. Bonnet, 1957: 2810.
Dendryphantes bicuspidatus:—Roewer, 1954: 1191.

Diagnosis. A rarely collected species from southern México and Guatemala. The distinctive embolus is long and bent, unlike that of *volcana*.

Male. Palpus (Figs. 214, 406): Embolus heavy, abruptly bends basal to opening. Rami small and subequal. Tibial apophysis appears double because ridge prolonged into second apophysis, more extreme than in *furcata* (Fig. 389). *Markings* (Fig. 405): Typical for the genus, with white cheek, forehead, and side bands. Cheek band moderately dense. Clypeus brown; hairs overhanging chelicerae white medially, brown laterally. White forehead band contacts AMEs dorsally 10:00–12:30. Chelicerae with thin patch of pale white scales medially extending to ⅔ length. Palpus femur distinctly paler than more distal segments. Cymbium lacking white scales. Legs with fairly distinct annulation; back of tibia 2 uniformly pale; femur 3 dark in distal ⅓. Abdomen dorsum more or less solid brown, without trace of dark spots, surrounded by discrete white side bands on abdomen. (Description based mostly on Chiapas ♂.) *Measurements:* Body length 2.7, 3.2 mm; carapace length 1.3, 1.5 mm, width/length 0.77, 0.83; n = 2♂ from Chiapas and Guatemala.

Female. None matched to male. Cambridge's *P. ochracea* may represent the female of *P. bicuspidata*.

Records (Map 23). In addition to the holotype, one other male is known, from México: Chiapas: pine forest, 24 km NW of Arriaga 94.01°W, 16.25°N, 27 August 1966 (AMNH).

25. *Pelegrina ochracea*
(F. P.-Cambridge, 1901)
new combination
Figures 407–409; Map 23

Metaphidippus ochraceus F. P.-Cambridge, 1901: 272, pl. 25, figs. 6, 6a, ♀. Holotype in BMNH 1♀ with label "Dendryphantes ochraceus, sp. n. Type ♀, Guat. (Sarg)," examined. Bonnet, 1957: 2816. Chickering's *M. ochraceus* (1946: 312) is not the same as this species, nor is it a *Pelegrina*.
Dendryphantes ochraceus:—Roewer, 1954: 1198.

Diagnosis. The epigynum is similar to that of *P. furcata*, but the flaps are not quite so convex and are shorter. As already noted, this could be the female of *P. bicuspidata*.

Female. Epigynum (Figs. 407, 408): Flaps convex, parallel, and fairly short; light brown; behind them the surface is gently concave with mound restricted to near posterior margin, and median ridge extending from flaps to posterior mound. First curve of duct narrow; second curve proceeds medially. *Markings* (Fig. 409): Carapace red-brown, thinly covered with white scales. Clypeus covered with white scales, scales surrounding AMEs white. Legs lacking strong annulae, tan to light brown. Abdomen light brown with pale markings (Fig. 409). *Measurements:* Holotype body length 4.0 mm; carapace length 1.6 mm, width/length 0.75.

Records (Map 23). MÉXICO: OAXACA: Oaxaca, Base San Felipe Mtn., 16–17 September 1947 (1♀, AMNH); CHIAPAS: San Cristóbal, 13 September 1947 (1♀, AMNH). *GUATEMALA* (1♀, BMNH).

26. *Pelegrina morelos* new species
Figures 215, 410–414; Map 23

Holotype male in AMNH with label "7 mi [11 km] N Cuernavaca, Morelos, Mexico, July 3, 1941, A M and L I Davis."

Etymology. A noun in apposition, after the type locality.

Diagnosis. Much like *furcata*, but the retrolateral ramus of the embolus is prolonged and curves to the prolateral. The female matched to the holotype has much more contrasting markings than in *furcata* and epigynal ducts with a much narrower second curve.

Male. Palpus (Figs. 215, 411): Embolus with two blunt rami much like those of *furcata*, but the retrolateral is long and curves to the prolateral. Tibial apophysis appears double because ridge prolonged into second apophysis. *Markings* (Fig. 410): Carapace side bands dense and discrete. Cheek bands weak. Clypeus brown; setae overhanging chelicerae dark except a few white hairs medially. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with a few white scales medially. Palpus cymbium brown, lacks white scales. Abdomen with white side bands and paired white spots reminiscent of female. *Measurements:* Body length 38 mm; carapace length 1.9 mm, width/length 0.78.

Female. Epigynum (Figs. 412, 413): Flaps long and convex, dark. Epigynal surface slightly concave, rises gradually behind flaps to higher posterior margin. First curve of duct broad; second curve narrow, proceeds medially. *Markings* (Fig. 414): Carapace brown, thinly covered with white scales. Clypeus covered with white scales though scales surrounding AMEs are orange laterally and medially. Legs annulate. Abdomen strongly marked with four distinct pairs of white spots on dark background; fourth pair large and transverse. *Measurements:* Body length 4.7 mm; carapace length 1.9 mm, width/length 0.80.

Male/Female Matching. The female described is matched tentatively with the male, for both are similar to *furcata* in genitalia, they have similar abdominal markings with strong lateral fourth pair of spots, and they occur sympatrically.

Records (Map 23). In addition to the male holotype, the single female known is from: México: Morelos: Cuernavaca, July 1953 (AMNH).

27. *Pelegrina huachuca* new species
Figures 216, 415–419; Map 24

Holotype male in AMNH with label "ARIZONA: 8000 ft. [2,440 m], Carr Canyon, Huachuca Mts., June 3, 1952."

Etymology. A noun in apposition, after the type locality.

Diagnosis. Most distinctive for its large branched embolus bearing some resemblance to that of *P. furcata*. Females matched with the male have long flaps in a distinctively sculptured epigynum.

Male. Palpus (Figs. 216, 416): Embolus large and unusual, with retrolateral ramus extended retrolaterally as a long blade. Tibial apophysis appears double because ridge prolonged into second apophysis. *Markings:* Typical for the genus, with cheek, side, and forehead bands on the carapace and side bands on the abdomen. Cheek band moderately dense. Clypeus brown; hairs overhanging chelicerae dark with some white centrally. White forehead band contacts AMEs dorsally. Chelicerae with a few pale scales medially. Legs with indistinct annulation. *Measurements:* Body length 3.7 mm; carapace length 1.8 mm, width/length 0.77; n = 1♂ from Huachuca Mtns., Arizona.

Female. Epigynum (Figs. 417, 418): Flaps dark, long, and parallel. Surface bulges just medial to flaps about half way along their length; behind this the surface is concave, rising gradually into pronounced medial and posterior bulge. First curve of ducts very broad; second curve goes anteriomedially. *Markings* (Fig. 419): Carapace covered with white scales with some light brown. Clypeus densely white; white between AMEs. AME scales yellowish white above, white below. Abdomen brown; central pale spots are laterally directed bars, side bands. *Measurements:* Body length 4.5, 5.1 mm; carapace length

2.1, 2.2 mm, width/length 0.79, 0.80; n = 2♀ from Santa Catalina and Santa Rita Mtns., Arizona.

Male/Female Matching. As discussed under *P. chaimona*, there is doubt regarding the male/female association of *chaimona* and *huachuca*. The following evidence supports the matching of the females already described with the male of *huachuca*: the flaps of the female are long and convex, the surface has distinct concavities and bulges, and the first curve of the duct is very broad, as would be expected to match the robust embolus of *huachuca*; the cephalic plate is smoother than in *chaimona* males and females, as in the male *huachuca*; the females have been found in central Arizona, as was the male.

Distribution (Map 24). Southcentral and southeastern Arizona.

Records. UNITED STATES: ARIZONA: Cochise Co.: Huachuca Mtns., Garden Canyon Road, base of Sawmill Canyon, 19 March 1989 (3♂, MCZ), Huachuca Mtns., Carr Canyon, 3 June 1952, 2,400 m el. (1♂, AMNH), Chiricahua Mtns., upper Cave Creek, 10 May 1969, 1,800 m el. (1♀, AMNH), Chiricahua Mtns., Onion Saddle, 2,370 m el., 20 March 1989; Pima Co.: Santa Catalina Mtns. (1♀, AMNH); Santa Cruz Co.: Santa Rita Mtns., upper Madera Canyon, 1,700 m el., 13 August 1983 (1♀, MCZ).

Natural History. Collected from oaks (4 records).

28. *Pelegrina arizonensis* (G. & E. Peckham, 1901) new combination

Figures 160, 161, 217, 251, 420–425; Map 25

Dendryphantes arizonensis G. & E. Peckham, 1901b: 326, pl. 28, fig. 2, ♂. Holotype in MCZ 1♂ with 1 imm. with labels "Dendryphantes arizonensis Pkm, 1901. Arizona. Type. ♂." (label is original; handwritten, probably by Elizabeth Peckham) and "G. W. Peckham Coll.", examined. G. & E. Peckham, 1909: 463, pl. 36, fig. 7, ♂. Roewer, 1954: 1206.

Dendryphantes glacialis Scheffer, 1905, figs. 3, 4, 8, ♂♀. Type material lost (Cutler and Jennings, 1985), though the Peckham collection has some material labeled *Dendryphantes glacialis* from Manhattan, Kansas, possibly sent by Scheffer, examined. G. & E. Peckham, 1909: 463, pl. 37, figs. 7, 7a, b, ♂♀. Roewer, 1954: 1210.

Dendryphantes (Metaphidippus) arizonensis:—Petrunkevitch, 1911: 622.

Dendryphantes mimus:—Chamberlin, 1925b, in part: 135, fig. 52 ♀.

Metaphidippus arizonensis:—Bonnet, 1957: 2810. Cutler and Jennings, 1985: 3, figs. 3–11, ♂♀.

Metaphidippus glacialis:—Bonnet, 1957: 2814.

Diagnosis. Like *helenae* this species has genitalia unusual for the genus, with the erect portion of the embolus arising retrolaterally and the epigynal flaps far rotated. Differs from *helenae* in having a sharp pointed embolus, short tibial apophysis, and flaps rotated only 180°.

Male. Palpus (Figs. 217, 421, 422): Embolus arising toward retrolateral side, blade-shaped and with exposed surface concave, with retrolateral ridge extending into distal point. Tibial apophysis almost hidden behind wide flange beneath it. *Markings* (Figs. 160, 420): Cheek bands weak. Markings on face quite variable. Clypeus brown, sometimes with a few white hairs, hairs overhanging chelicerae white to brown. White forehead band contacts AMEs dorsally 10:30–12:00. Chelicerae lacking pale scales Cymbium with none to a few white scales. Abdomen showing lineate markings of females, with two medial longitudinal stripes in addition to the side bands. *Measurements:* Body length 4.0(4.3)4.3 mm; carapace length 2.0(2.0)2.0 mm, width/length 0.80(0.81) 0.83; n = 5 ♂ from Minnesota.

Female. Epigynum (Figs. 251, 423, 424): Flaps rotated 180° so that ancestrally posterior end is anterior. Surface flat except for concavity in front of flaps. First curve of duct broad, on medial side of opening because of flap rotation; second curve proceeds laterally. *Markings* (Figs. 161, 425): Carapace with white scales dorsally. Clypeus densely covered with white scales. Abdominal markings strikingly lineate, with two central pale bands flanked by two thin rows of dark spots, flanked by brown bands and pale side bands. *Measurements:* Body length 4.7(4.9)5.9 mm; carapace length 2.0(2.0)2.2 mm, width/length 0.77(0.80) 0.84; n = 5♀ from Minnesota.

Courtship (1♂ observed from Anoka Co., Minnesota): The one male observed showed no crouch display. *Raisespread* (n = 16): Abdomen twitched on pause (n = 3). First legs waved irregularly on series (n = 9); as he got closer legs lowered, put forward and more parallel but no discrete crouch display was seen (n = 7). Palpi wave irregularly on series (n = 4).

Distribution (Map 25). Minnesota and Alberta south to Zacatecas and Tlaxcala.

Records. CANADA: ALBERTA: Medicine Hat (1♂ 1♀, AMNH). *UNITED STATES:* MINNESOTA: Anoka Co.: 5 km E of Bethel (1♂ 3♀, MCZ; 1♂ 3♀, AMNH); NORTH DAKOTA: Burleigh Co.: Menoken Indian Village (1♂, MCZ); Williams Co.: Williston (1♂ 3♀, WPM); KANSAS: Riley Co.: Manhattan (1♂ 1♀, MCZ); COLORADO: Denver (1♂, MCZ); TEXAS: Brewster Co.: Marathon (1♂ 1♀, AMNH); Alpine (1♂, AMNH); NEW MEXICO: Bernalillo Co.: Sandia Mtns. (2♂, AMNH); Hidalgo Co.: 3 km N of Rodeo (1♂, AMNH); Lincoln Co.: T6N R6ES74 (1♂); near Nogal (1♂); Sierra Co.: 5 km E Hillsborough (1♂, MCZ); 24 km N of Ruidoso (7♂ 6♀, AMNH); Torrance Co.: 1.6 km E Clines Corners (1♀, AMNH); Valencia Co.: 3 km E of Grants (1♂ 1♀, AMNH); ARIZONA: Coconino Co.: Sitgreaves National Forest (1♂, AMNH); Graham Co.: Thatcher (1♂ 2♀, MCZ); Santa Cruz Co.: 29 km NW of Nogales (1♀, AMNH). *MÉXICO:* ZACATECAS: 11 km SE of Salinas (San Luis Potosí) on Hwy 45, ca. 101°39′W, 22°34′N (2♀, MCZ); DURANGO: Rodeo (5♀, AMNH); Santa María del Oro (1♀, AMNH); TLAXCALA: 13 km W of Calpulapan (2♀, AMNH). Cutler and Jennings (1985) give additional records.

Natural History: Collected from sand prairie (Minnesota, 1 record), *Hymenoclea* (New Mexico, 1 record), ponderosa pine (Arizona, 2 records), grass-mesquite (Arizona, 1 record), and beating junipers (1 record, New Mexico) at elevations of 1,700–2,200 m in Arizona, Zacatecas, and Durango. Jennings (1973) describes egg retreats of this species in *Tragopogon* and *Pinus ponderosa.* Cutler and Jennings (1985) give additional habitat information and characterize *P. arizonensis* as a species of grasslands.

29. *Pelegrina helenae* (Banks, 1921)
new combination
Figures 155, 218, 426–431; Map 25

Dendryphantes helenae Banks, 1921: 101, fig. 5, ♂♀. Type material in CAS 1♂ 1♀ with labels "Dendryphantes helenae Bks type," "San Francisco, Cal. IV-7-'18," and "Coll and don by Helen Van Duzee," examined. Roewer, 1954: 1211.

Dendryphantes sausalitanus Chamberlin, 1925b: 137, figs. 57, 58, ♂. Type in MCZ 1♂ with label "Dendryphantes sausalitanus Ch, ♂ holotype, Cal.: Sausalito 1909, R. V. Chamberlin Coll., 1045," examined.

Metaphidippus helenae:—Gertsch, 1934: 18. Bonnet, 1957: 2814. Cutler and Jennings, 1985: 5, figs. 12–17, ♂♀.

Diagnosis. Differs from *arizonensis* in having blunt embolus, tibial apophysis on an elongate projection, and epigynal laps rotated very far, to 270°.

Male. Palpus (Figs. 218, 427, 428): Erect portion of embolus is blade-shaped and blunt and arises toward retrolateral side of base. Tibial apophysis and flange elevated on narrow projection (Fig. 427). *Markings* (Fig. 426): generally dark with weak white side bands on carapace and abdomen. Cheek band very weak. Clypeus brown; hairs overhanging chelicerae dark, sometimes pale medially. White forehead band contacts AMEs dorsally 10:30–1:00. Chelicerae lacking pale scales. Cymbium with none to a few white scales. Longitudinal markings on abdominal dorsum, with central longitudinal lighter brown band flanked by black bands. *Measurements:* Body length 4.0(4.2)4.3 mm; carapace length 1.8(2.0)2.1 mm, width/length 0.77(0.80)0.82; n = 5♂ from Nevada and Oregon.

Female. Epigynum (Figs. 429, 430): Flaps rotated 270°, so that ancestrally posterior end is lateral. Surface flat. First curve of duct anterior to opening because of flap rotation; second curve proceeds posteriorly. *Markings* (Figs. 155, 431): Carapace thinly to densely covered with white or gray scales. Clypeus densely covered with white scales. Abdominal markings somewhat lineate, but not so strongly as in *arizonensis,* with the posterior dark spots more prominent. *Measurements:* Body length 4.2(5.0)5.5 mm; carapace length 1.9(2.0)2.2 mm, width/length 0.76(0.80) 0.82; n = 5♀ from Oregon, Nevada, and Washington.

Distribution (Map 25). Wyoming to Washington south to Utah and California.

Records. UNITED STATES: IDAHO: Blaine Co.: Carey (1♂, AMNH); Custer Co.: Salmon River, 19 km N Challis (1♀, AMNH); Gem Co.: 11 km W of Horseshoe Bend, 116°18′W, 43°57′N (3♂, AMNH); 13 km W of Horseshoe Bend (1♀, AMNH); Jerome Co.: Twin Falls (1♂, AMNH); Owyhee Co.: Bruneau Canyon Hot Creek Falls (1♀, AMNH); WYOMING: Bighorn Co.: 10 km E of Shell (1♂ 2♀, WPM); UTAH: Little Cottonwood Campground, near Salt Lake City (3♂, AMNH); Sevier Co.: Richfield (1♂ 2♀, AMNH); NEVADA: Humboldt Co.: 48 km N of Winnemucca (1♀, AMNH); Washoe Co.: N of Reno (3♂ 1♀, MCZ); Reno (2♂, MCZ); WASHINGTON: Franklin Co.: just W of Palouse Falls, 46.66°N, 118.23°W, (3♀, MCZ); Grant Co.: Wahluke Wildlife Recreation Area, 46.705°N, 119.421°W (2♀, MCZ); OREGON: Baker Co.: Baker (1♀, AMNH); Crook Co.: 8 km W of Prineville (2♂ 7♀, AMNH); Deschutes Co.: Redmond (4♀, AMNH); Harney Co.: Tencent Lake (1♂ 3♀, AMNH), Manns Lake (1♂, AMNH); Klamath Co.: above Algoma (1♂, AMNH), Bly Mountain (1♀, AMNH); Malheur Co.: Succor Creek Canyon (2♂ 1♀, AMNH); E of Ontario, 116°57′W, 44°2′N (1♀, AMNH); Umatilla Co.: 19 km SW of Echo (1♀, AMNH); Wasco Co.: Mosier (1♀, AMNH); CALIFORNIA: Marin Co.: Sausalito (♂, MCZ); Mono Co.: Benton (2♀, AMNH); Riverside Co.: Lake Hemet 116°59′W, 33°43′N; San Diego Co.: 3 km E of Pine Springs (1♂, AMNH); Pine Valley (1♀, AMNH); San Francisco Co.: San Francisco (1♂ 2♀ MCZ); Sierra Co.: Peavine (3♀, AMNH). Additional records are given by Cutler and Jennings (1985).

Natural History. Collected from sagebrush (*Artemisia tridentata*; 7 records). Cutler and Jennings (1985) give additional habitat information.

30. *Pelegrina verecunda*
(Chamberlin & Gertsch, 1930)
new combination

Figures 162, 163, 219, 252, 432–436;
Map 26

Sassacus uteanus:—Chamberlin and Gertsch, 1929, in part: fig. 54 (this figure may have been misplaced, given that it is unlikely the authors would have confused their species *S. uteanus* and *D. verecundus*).

Dendryphantes verecundus Chamberlin and Gertsch, 1930: 144. Holotype 1♂ in AMNH with labels "*Dendryphantes verecundus* ♂ / Utah: Dry Canyon Holotype/ 6-14-29 Gertsch" and "29Bb. N40 : W111," examined.

Dendryphantes verecundus:—Roewer, 1954: 1216. Bonnet, 1956: 1402.

Metaphidippus verecundus:—Jung and Roth, 1974: 33.

Diagnosis. A small indistinctly marked species with dark males and pale females from the southwest. May be confused with the sympatric *orestes* but smaller, more gray than orange, lacking the lateral cheliceral ridge, and having the short embolus broadening gradually into base prolaterally.

Male. Palpus (Figs. 219, 433): Embolus short, obliquely truncate, broadens gradually into base prolaterally; rami indistinct. *Markings* (Figs. 162, 432): Carapace with scattered white scales; side bands weak. Cheek band weak. Clypeus brown; thin white to brown hairs overhanging chelicerae. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with some pale scales, scattered but especially medially. Palpus entirely brown, with femur not distinctly paler than cymbium. Cymbium lacking white scales. Abdomen side bands indistinct, often with white markings centrally. *Measurements:* Body length 2.7(3.1)3.6 mm; carapace length 1.3(1.5)1.7 mm, width/length 0.77(0.79)0.80; n = 5♂ from Yavapai Co., Arizona.

Female. Epigynum (Figs. 252, 434, 435): Flaps dark, parallel, slightly convex, posteriorly flush with surface. Surface flat. First curve of duct relatively narrow, dark; second curve proceeds slightly anteriorly. *Markings* (Figs. 163, 436): Carapace covered with white scales. Clypeus densely covered with white. Legs pale yellowish. Abdomen pale, with many small dark speckles sometimes coalescing into *galathea*-like pattern. *Measurements:* Body length 3.7(4.0)4.5 mm; carapace length 1.5(1.6)1.8 mm, width/length 0.77(0.78) 0.80; n = 5♀ from Yavapai Co., Arizona.

Male/Female Matching. This association is indicated by co-collecting, distribution, similar size, and indistinctness of markings.

Courtship (2♂ observed from Yavapai Co., Arizona). First legs held in a triangular bowed position during pause of crouch display, as in *P. aeneola. Crouch* (n = 15, 2♂): Body horizontal (n = 15, 2♂) and low (n = 13, 2♂) to high (n = 1). First legs held low and forward, bowed, with tips almost touching (n = 15, 2♂); on series legs extended forward and waved vigorously (n = 15, 2♂) though somewhat irregularly (n = 8, 1♂); on pause legs retracted (n = 12, 2♂) or not (n = 3, 1♂). Palpi held down (n = 11, 2♂). On series palpi held in and under and motionless (n = 3, 1♂); at end of series/start of pause palpi hang down and wave a few times (n = 3, 1♂). *Repertoires:* 2♂ crouch only.

Distribution (Map 26). Utah south into northern México.

Records. UNITED STATES (county records): UTAH: Kane (1♀, AMNH), Salt Lake (17♂ 1♀, AMNH), Sevier (3♂, AMNH), Utah (3♂ 7♀, AMNH), Wasatch (11♂ 3♀, AMNH), Washington (9♂ 1♀, AMNH, MCZ), Weber (2♂, AMNH); ARIZONA: Cochise (5♂ 12♀, AMNH, MCZ), Coconino (1♂, AMNH), Santa Cruz (1♀, MCZ), Yavapai (8♂ 11♀, AMNH, MCZ); NEW MEXICO: Bernalillo (2♂, AMNH), Catron (1♀, AMNH), Grant (3♀, AMNH), Sandoval (1♂, AMNH); CALIFORNIA: Mono (1♂, AMNH). *MÉXICO:* CHIHUAHUA: Las Delicias (1♂ 4♀, AMNH); ?Primavera (1♀, AMNH); 21 km N of Ciudad Camargo on Hwy 45, 105°13′W, 27°52′N (2♀, MCZ); ?40 km SW of Camargo (1♀, AMNH); ?DURANGO: Ojo de los Encinos (1♀, AMNH).

Natural History. Specimens collected at elevations from 1,100 to 1,800 m (12 records). In Arizona, beaten from *Quercus, Cercocarpus, Alnus, Salix, Chrysothamnus,* pine, and spruce (6 records). Jung and Roth (1974) found this species in their zone 2 of the Chiricahua Mountains.

31. *Pelegrina clavator* new species

Figures 164, 165, 220, 437–441; Map 15

Holotype male and paratype female with label "MEXICO: NUEVO LEON: Chipinque Mesa just S of Monterrey, ca. 4500 ft. [1,370 m]; ca. 100.4°W 25.6°N, 2 Jun 1983, W. Maddison & R. S. Anderson 83-034, beating and sweeping forest understory."

Etymology. A Latin noun in apposition, "club-bearer," referring to the large blunt embolus.

Diagnosis. A Mexican species having a distinctive broad, truncate embolus and angled flaps flanking a central mound on the epigynal surface.

Male. Palpus (Figs. 220, 438): Embolus broad, truncate, with rami small. Embolus twists toward tip. *Markings* (Figs. 164, 437): Carapace with large forehead band. Cheek band dense and distinct from side band. Clypeus brown in two specimens, brown with white scales between AMEs in another specimen; hairs overhanging chelicerae brown to tan. White forehead band contacts AMEs dorsally; setae ringing AMEs white except 12:00–1:30. Chelicerae with dense patch of white scales from base to ⅔ length, longer and wider than in *variegata*. Cymbium lacking white scales. *Measurements:* Body length 4.1, 4.2, 4.3, 4.4 mm; carapace length 2.1, 2.1, 2.1, 2.2 mm, width/length 0.76, 0.77, 0.77, 0.80; n = 4♂ from Nuevo León.

Female. Epigynum (Figs. 439, 440): Flaps flat and convergent, medial edge at level of high central plateau and lateral edge in concavity so that flap slopes down laterally. Epigynal surface high between flaps as noted. First curve of duct broad but does not extend so far posterior as in the sympatric *neoleonis,* so that second curve begins at or only a bit posterior to posteriormost portion of flap; second curve proceeds obliquely medial-anterior. Flowerlike gland opening on anterior face of second curve. Inner surface of third curve fairly smooth. *Markings* (Fig. 441): Carapace covered above with white scales. Clypeus covered densely with white scales. Abdomen marked somewhat like *P. galathea*. *Measurements:* Body length 4.0, 4.2 mm; carapace length 2.0, 2.0 mm; width/length 0.76, 0.77; n = 2♀ from Nuevo León.

Male/Female Matching. Males and females were matched by co-collecting at two localities in Nuevo León, by common distribution; and by the similar robust carapace and abdominal markings.

Geographical Variation. Females from Tamaulipas and Veracruz have smaller flaps less deeply set into epigynum, with less flaring ducts, and may represent another species.

Courtship (2♂ observed from Chipinque Mesa, Nuevo León). *Raisedspread* (n = 3, 1♂). *Crouch* (n = 3, 2♂): First legs foward, slightly spread, horizontal (n = 1) or raised fairly high to ca. 40° (n = 2, 1♂), lowered when close (n = 2, 1♂); not noticeably waved (n = 3, 2♂). Palpi down (n = 3, 2♂), waved on series (n = 3, 2♂) and when very close and reaching (n = 2, 1♂). Abdomen twitched occasionally, possibly at pause (n = 2, 1♂). *Repertoires:* 1♂ crouch only; 1♂ raisedspread and crouch.

Distribution (Map 15). Nuevo León south to Veracruz.

Records. MÉXICO: TAMAULIPAS: ca. 1.5 km E of Tula, 99.5°W, 22.9°N, 8 June 1983 (1♀, MCZ); Sierra de Tamaulipas, 4–7 August 1945 (1♂, AMNH); SAN LUIS POTOSI: 32 km E of Ciudad del Mais, 23 March 1940 (1♀, AMNH); NUEVO LEÓN: Chipinque Mesa, just S of Monterrey, 100.4°W, 25.6°N, 2 June 1983 and 7 April 1946 (3♂ 1♀, MCZ; 1♀ AMNH); Villa de Santiago, Hacienda Vista Hermosa, 19 June 1940 (1♂, MCZ); VERACRUZ: 2 km SE of Naolinco on Hwy 127, 96.9°W, 19.6°N, 20 June 1983 (1♀, MCZ).

Natural History. Collected from understory shrubs of broadlead forest at ca. 1,400 m elevation (2 records); also known from 600 to 800 m elevation (3 records).

32. *Pelegrina pallidata* (F. P.-Cambridge, 1901) new combination

Figures 221, 442–446; Map 29

Metaphidippus pallidatus F. P.-Cambridge, 1901: 270, pl. 24, figs. 17, 17a, ♀. Holotype in BMNH 1♀ with label "Dendryphantes pallidatus, sp. nov. Guat. Sarg Type ♀," examined. Bonnet, 1957: 2816.
Dendryphantes pallidatus:—Roewer, 1954: 1198.

Notes on Synonymy. The specimens described here are identified with Cambridge's *pallidata* primarily on the basis of similarities in the details of the epigynum. This identification is made with some hesitation, for the type material of *pallidata* consists of a single poorly marked female whose epigynum was lost by me in the course of examination, but my notes and the figures of C. L. Scioscia (personal communication) regarding the epigynum are fairly detailed and provide evidence for the identification. Compared to the other Mexican and Central American species with small, convergent flaps and a fairly flat epigynal surface (*variegata, sandaracina, yucatecana, verecunda*) the females described below and the type of *pallidata* are unique in having (1) an unusually broad dark band along the margin of the opening (Fig. 445), (2) first curve of duct wide and long, (3) the flowerlike gland openings placed on the anterior surface of the second curve and more medially (closer to junction with third curve than first curve), and (4) fertilization ducts arising anterior to the center of the lumen of the spermatheca.

Male (Tentatively Associated with Female). Palpus (Figs. 221, 443): Embolus twists apically. Retrolateral ramus relatively long and curved, as in *P. pervaga* and *tristis*, but embolus much smaller than in those species. *Markings* (Fig. 442): Carapace medium to pale brown, with well-developed side and cheek bands. Clypeus brown except for patch of white scales between AMEs that overhangs chelicerae. White forehead band contacts AMEs dorsally 10:30–12:00. Chelicerae with white scales medially. Cymbium with some white scales. Legs beige with brown annulae. Abdomen shows white spots of female. *Measurements:* Body length 3.4 mm; carapace length 1.7 mm, width/length 0.77, n = 1♂.

Female. Epigynum (Figs. 444, 445): Flaps convergent, not very convex. Epigynal surface flat. First curve of duct fairly broad and long; second curve goes anteriomedially. As already noted, there is an unusually broad band along the margin of the opening (Fig. 445, arrow), the flowerlike gland openings are placed on the anterior surface of the second curve close to junction with third curve, and the fertilization ducts arise anterior to the center of the lumen of the spermatheca. *Markings* (Fig. 446): Cambridge's holotype is now uniformly pale, though may be partly faded. The other available specimens have the carapace covered with yellowish white scales, though not densely. Clypeus densely covered with white scales; AMEs entirely ringed by white scales. Legs uniform orange-brown except Nicaragua ♀, which has some brown spots. Sternum distinctly darker than coxae. Abdomen with paired white spots on brown dorsum; each spot in first pair fused with spot in second pair. Venter dark between epigynum and spinnerets. *Measurements:* Body length 4.0, 4.3 mm; carapace length 1.6, 1.7 mm, width/length 0.76, 0.78; n = 2♀, female holotype and 1♀ from Nicaragua.

Male/Female Matching. This is indicated by co-collecting in Nicaragua and similarity of markings.

Distribution (Map 29). Southern México to Nicaragua.

Records. *MÉXICO:* CHIAPAS: 5 km W of San Cristóbal de Las Casas on Hwy 190, ca. 92°41′W, 16°44′N, 27–28 July 1983, W. Maddison & R. S. Anderson (1♀, MCZ). *GUATEMALA* (1♀, BMNH); Chichicastenango, 6–7 August 1947, C. & P. Vaurie (2♀, AMNH). *NICARAGUA:* Matagalpa, 4 October 1952, R. B. Swain (1♂ 1♀, AMNH).

Natural History. The female from near San Cristóbal was collected beating oak, madroño, and pine in oak-pine woodland at 2,100 m elevation.

33. *Pelegrina variegata* (F. P.-Cambridge, 1901) new combination

Figures 166, 167, 222, 253, 447–451; Map 28

Metaphidippus variegatus F. P.-Cambridge, 1901: 268, pl. 24, figs. 10, 10a, 11, 11a, ♂♀. Holotype in BMNH 1♂ with 1♀ with label "Philaeus variegatus F.Cb., Type ♂, gynetype ♀ Mexico. Amula [Guerrero]. H. S.", examined.

Beata variegata:—Simon, 1903: 841. Roewer, 1954: 1008. Bonnet, 1955: 874. Chickering's *Beata variegata* (1946: 267, figs. 226, 227) is not this species, nor is it a *Pelegrina*.

Diagnosis. Probably the most commonly collected Mexican species, reminiscent of *galathea.* Males distinctive for their strong white spotting on the abdomen and robust chelicerae. Females can be identified by the epigynal topography.

Male. Palpus (Figs. 222, 448): Embolus relatively narrow, parallel-sided, twisted so that tip appears to taper in ventral view, but oblique view shows two small, subequal rami; embolus widens abruptly at its base on retrolateral side, so as to make distinct angle. *Markings* (Figs. 166, 447): Carapace with extensive white markings. Cheek band broad and dense, fused with side band. Clypeus brown, with setae overhanging chelicerae white medially, some brown hairs laterally. White forehead band contacts AMEs dorsally; setae ringing AMEs white except from 12:30 to 2:00. Chelicerae robust, though not elongate, with white patch on medial surface from base to about ½ length. Cymbium with central patch of white scales. Legs distinctly annulate. Abdomen not striped as in most *Pelegrina* males but rather with paired white spots almost as in ♀. *Measurements:* Body length 3.4(3.9–4.2)4.4 mm; carapace length 1.7(1.9–2.1)2.2 mm, width/length 0.79(0.80–0.81)0.84; n = 6♂ from Oaxaca, Nuevo León, and Nayarit.

Female. Epigynum (Figs. 253, 449, 450): Flaps slightly convex, usually convergent and somewhat rotated. Epigynal surface rather flat, without pronounced posterior mound; medial surface at about same height throughout. Between the flaps is a medial longitudinal ridge; nearer the flaps, the surface is lower. First curve of duct pale, narrow; second curve proceeds medially, bearing flowerlike gland opening on dorsal surface of duct. *Markings* (Figs. 167, 451): Carapace covered with gray-white scales, sometimes mixed with light brown. Clypeus densely covered with yellowish white scales. Abdominal markings much like *galathea,* with white or beige spots on tan to gray background. *Measurements:* Body length 3.5(4.1–4.2)4.9 mm; carapace length 1.6(1.8)1.8 mm, width/length 0.76(0.78)0.83; n = 7♀ from Oaxaca.

Male/Female Matching. This association is indicated by extensive co-collecting and by the similarity of markings on abdomen.

Courtship (4♂ observed from two locations in Tamaulipas and Oaxaca): *Raised-spread* (n = 3, 3♂). *Crouch* (n = 19, 4♂): Body horizontal (n = 19, 4♂), normal to low height (n = 2, 1♂). First legs held forward, horizontal to 10° raised, bowed, tips slightly convergent, parallel or slightly spread, not touching (n = 19, 4♂). On each series legs flickered (n = 9, 1♂) noticeably (n = 1) or with fairly low amplitude (n = 7, 3♂) or perhaps not at all (n = 3, 1♂). Palpi held down (n = 12, 4♂), pointing inward and resting over chelicerae (n = 7, 2♂), on each series flickered with fairly low amplitude (n = 12, 1♂) outward (n = 1) or up and down (n = 7, 2♂). Abdomen twitches (n = 6, 1♂) at end of each series (n = 3, 1♂) or in pause (n = 4, 2♂).

Distribution (Map 28). Nuevo León south to Panamá.

Records. Most in AMNH; some in MCZ, from: *MÉXICO:* TAMAULIPAS: 11 km E of Ocampo, 99°16′W, 22°49′N (1♀); 35 km SSW of Mante (3♂); Paso del Abra 99.01°W, 22.45°N (1♂); Mante (1♂ 5♀); 23 km S of Villa Juarez (1♀); Hidalgo (1♂); 19 km SE of Ciudad Victoria (1♀); Rio Guajolotes, 64 km S of Victoria (2♂ 2♀); Sisal, 24 km S of Victoria (2♂ 2♀); Ciudad Victoria (1♂ 3♀); 18 km N of Victoria (1♂); SAN LUIS POTOSÍ: Covadonga, WSW of Valles 99.05°W, 21.57°N (1♀); Valles (2♀); Taninul, Valles (1♂ 1♀); El Salto (1♂); 19 km E Ciudad del Maiz (1♀); Pujal (1♀); NUEVO LEÓN: Santa Rosa Canyon 29 km W of Linares (2♂ 2♀); Montemorelos (1♀); CHIHUAHUA: 8 km S of Chihuahua (1♂); Catarinas (1♂); SINALOA: 64 km S of Culiacan (1♂); 48 km N of Mazatlan (1♂ 1♀); 10 km E of Villa Union (1♂); Culiacancito 107.32°W, 24.50°N (2♂); DISTRITO FEDERAL: Xochimilco (1♂); MORELOS: Cuernavaca (1♀); NAYARIT: Tepic (14♂ 11♀); 43 km S of Tepic (1♀); 56 km S of Tepic (1♂ 1♀); La Mesa de Nayarit (2♀); San Blas (1♂); Jalisco (1♀); Jesús María (2♂); JALISCO: Zapotlanejo (1♂); Zapotlanejo (1♂); COLIMA: 32 km N of Colima (1♂ 1♀); GUERRERO: Iguala (1♂ 1♀); Chilpancingo (1♂); Teloloapan (7♀); VERACRUZ: Plan del Rio (2♂ 1♀); Tierra Colorado (2♂ 1♀); OAXACA: 2 km S of El Tule (2♂ 8♀); 3 km W of Tapanatepec (1♂); Oaxaca (1♂); San Felipe, N of Oaxaca City (3♂ 4♀); Paso Real, Rio Tonto (1♀); Tehuantepec (4♂); Monte Alban (1♂); 3 km SE of Niltepec, 94.33°W, 16.32°N (1♂); Soladad (2♂); CAMPECHE: Campeche (2♂ 5♀); YUCATÁN: Progresso (1♂); Motul (1♂); Chichen Itza (2♂); CHIAPAS: Arriaga, N of Arriaga Mtns. (1♀); 24 km NW of Arriaga 94.01°W, 16.25°N; Cintalapa (8♂ 9♀); Ocozucuantla (3♂ 4♀); Rio de las Flores, 30 km NE of Cintalapa (7♂ 8♀); Tuxtla Gutierrez (4♂ 1♀); Las Cruzes (3♂ 1♀). *HONDURAS:* Zamorano. *NICARAGUA:* San Marcos (1♂ 4♀). *COSTA RICA:* San Jose (1♀). *PANAMA:* 8 km S of El Valle (2♂).

Natural History. Collected beating *Acacia*, composites, and other vegetation in desert scrub at 1,500 m elevation (Oaxaca); beating shrubs and trees in fairly dry bottom of river valley at 600 m elevation (Nuevo León); and from a pine forest (Chiapas). Known from 220 to 1,700 m elevation throughout México (8 records).

34. *Pelegrina yucatecana* new species
Figures 169, 223, 452–456; Map 29

Holotype male and paratype female in MCZ with labels "MEXICO: YUCATAN: 3 km E of Chichen Itza ruins on Hwy 180, ca. 88°34′W 20°40′N, 19–20 July 1983 W. Maddison & R. S. Anderson, 83-115 seasonal forest, beating understory and trailside shrubs and small trees."

Etymology. An adjective, formed after *yucateco* (Spanish) or yucatecan (English), referring to the Yucatán Peninsula.

Diagnosis. An interesting species with unusual transverse abdominal markings; in genitalia resembling *variegata* and *sandaracina* but differing from both in details.

Male. Palpus (Figs. 223, 453): Embolus short, with rami very small. Erect portion of embolus with sides parallel; widens abruptly at base so that a distinct angle is made between the erect portion and base along the prolateral margin. *Markings* (Fig. 452): As only known ♂ is teneral, its proper colors are not exactly known, though appears brown with white markings. Marginal band well developed. Carapace with forehead band an acute V, proceeding more posteriorly from AMEs than laterally. Cheek band dense, and distinct from side band. Clypeus brown, with setae overhanging chelicerae dark. White forehead band contacts AMEs dorsally 10:30–12:00. Chelicerae with dense medial patch of white scales from base to ½ length. Cymbium dark basally, paler at tip; lacking white scales; patella and tibia dark. Legs strongly annulate, differing from *sandaracina* in having the back 2 annulate instead of longitudinally striped. Abdomen shows transverse pattern similar to ♀. *Measurements:* Body length 3.4 mm; carapace length 1.7 mm, width/length 0.82.

Female. Epigynum (Figs. 454, 455): Flaps very pale and slightly convergent, long, about half as long as epigynum. Surface flat. First curve of duct pale, fairly narrow; second curve proceeds slightly anteriorly. *Markings* (Figs. 169, 456): Carapace brown dorsally except three white transverse bands: between small eyes, just in front of fovea, and just behind fovea; the first two are sometimes connected by two small white longitudinal bands. Face dark, with only scattered pale scales. In particular, the clypeus lacks white beneath the AMEs except for setae overhanging chelicerae and ringing AMEs. Legs strongly annulate. Abdominal markings unusual transverse dark spots. *Measurements:* Body length 3.4(3.8–4.0)4.9 mm; carapace length 1.7(1.8)1.9 mm, width/length 0.77(0.81) 0.83; n = 4♀ from Yucatán and Campeche.

Male/Female Matching. Males and females have similar markings on abdomen and similarly annulate legs; the thin embolus would be expected matched to a female with weak flaps; and they are microsympatric at Chichen Itza.

Distribution (Map 29). Yucatán Peninsula.

Records. MEXICO: YUCATÁN: 3 km E of Chichen Itza, 88°34′W, 20°40′N, 19–20 July 1983 (1♂ 1♀, MCZ); 4 km N of Xocenpich, 88°34′W, 20°47′N, 20 July 1983 (1♀, MCZ); 12 km S of Muna on Hwy 261, 89°46′W, 20°24′N, 21 July 1983 (1♀, MCZ); CAMPECHE: Chicanna ruins 8 km W of Xpujil, 89°31′W, 18°32′N, 12–14 July 1983 (1♀, MCZ).

Natural History. One of the few lowland tropical species of *Pelegrina.* All known specimens were collected beating shrubs and small trees in understory and along trails through short tropical forest.

35. *Pelegrina sandaracina* new species
Figures 168, 224, 457–463; Map 29

Holotype male in MCZ with label "MEXICO: CAMPECHE: 6 km W of Francisco Escarcega, "El Tormento" forest station, ca. 90°48′W, 18°37′N. 11–12 July 1983 W. Maddison 83-107, beating understory shrubs of forest of small trees."

Etymology. Latinized from the Greek *sandaracinos,* orange-colored (Woods, 1966).

Diagnosis. This Mexican and Central American species shares with the sympatric *yucatecana* and *variegatus* prominent pale patches on the chelicerae of the male and a relatively small embolus but differs from both in having a patch on the clypeus between the AMEs of distinctly yellow scales and in lacking prominent pale patches on the abdominal dorsum. The erect portion of the embolus broadens more gradually into the base than in *yucatecana.* The female is orange, superficially bearing close resemblance to *Nagaina incunda* but differs in having yellow scales on the face even under the AMEs, and in having stronger epigynal flaps. See also comments under *P. pallidata.*

Male. Palpus (Figs. 224, 458): Embolus small, wider at base and tapering to tip, broadens gradually into embolar base so that along prolateral margin there is no angle distinctly marking embolus from its base. *Markings* (Figs. 168, 457): Carapace well marked with discrete bands of yellow scales. Marginal band weak or absent. Cheek band broad and dense though distinct from side bands, unlike *variegatus.* Clypeus with prominent patch of yellow scales between AMEs and overhanging the chelicerae, otherwise brown. Yellow forehead band contacts AMEs dorsally 11:00–1:00. Chelicerae with long dense patch of yellow scales on medial edge from base to ¾ length. Cymbium dark, lacking white scales; tibia and patella paler. Legs orange with strongly contrasting markings of dark brown. On posterior lateral face of second leg tibia is a longitudinal dark band. Dark on femur 3 restricted to subterminal spot on front and back. Abdomen in some males with distinct paired dark spots. *Measurements:* Body length 3.0(3.1)3.6 mm; carapace length 1.4(1.5)1.9 mm, width/length 0.78(0.80–0.81)0.81; n = 4♂ from Campeche, Oaxaca, Jalisco, and "Managna," México.

Female. Epigynum (Figs. 459, 460, 462, 463): Flaps convergent, shorter than those of sympatric *yucatecana,* less than half length of epigynum. Surface flat. First curve of duct pale in Yucatán ♀, dark in others; second curve proceeds a bit anteriorly, unlike *Nagaina incunda*, in which second curve proceeds more posteriorly. *Markings* (Fig. 461): Solid yellow-orange in color except for small speckles and paired dark spots on abdomen of southern females. Carapace covered with yellow scales. Face thickly covered with yellow to yellowish white scales. *Measurements:* Body length 3.2 mm; carapce length 1.5 mm, width/length 0.78; n = 1♀ from Yucatán.

Male/Female Matching. This matching is tentative, made partly because the female's scales are yellow as are the markings of males. Most members of the genus have white scales on the female clypeus and on male markings, and where the male has yellow markings (*P. insignis, Nagaina incunda*) so does the female. The males and females matched are also sympatric, and the weak embolus of the male matches the weak epigynal flaps of the female. Also, the geographic variation in paired abdominal spots is parallel in the males and females.

Geographical Variation. The holotype male and single female known from the Yucatán have the abdomen uniformly brown or orange (except for the male's side bands), in contrast to both males and females from farther south and west (Chiapas, Jalisco, Oaxaca), which have in addition paired dark brown dots on dorsum. The southern and western males also differ in having a longer embolus, and the females in having darker and more convergent flaps (Figs. 462, 463).

Courtship (1♂ observed from Francisco Escarcega, Campeche). No crouch display observed. *Raisedspread* (n = 5): Carapace high (n = 5); abdomen depressed (n = 4). First legs spread wide (n = 5); femur raised but distal segments horizontal (n = 4); legs moved to more parallel as he got closer (n = 1); waved little if at all (n = 1). Palpi down (n = 4).

Distribution (Map 29). Southern México to Nicaragua.

Records. MÉXICO: YUCATÁN: Grutas de Loltun, 7 km S of Oxkutzcab, 89°27′W, 20°15′N, 22 July 1983 (1♀, MCZ); CAMPECHE: 6 km W of Francisco Escarcega, "El Tormento" forest station, 90°48′W, 18°37′N, 11–12 July 1983 (1♂, MCZ); CHIAPAS: Arriaga, S of Arriaga Mtns., low coast, 1 September 1947 (1♀, AMNH); Tuxtla Gutierrez, 9 September 1947 (1–, AMNH); OAXACA: Tuchitan, 30 August 1947 (1♀, AMNH); Tehuantepec, 21 January 1948 (1♀, AMNH); Salina Cruz, 27 August 1947 (2♂, AMNH); JALISCO: Puerto Vallarta, August–September 1957 (1♂, AMNH); NAYARIT: La Libertad, 6 August 1947 (1♀, AMNH). *NICARAGUA:* Masachapa, September 1953 (1♂, AMNH).

Natural History. One of the few lowland tropical species of *Pelegrina*. Beating understory shrubs of open forest of small trees (1 record).

36. *Pelegrina tillandsiae*
(Kaston, 1973) new combination
Figures 225, 254, 472–477; Map 27

Metaphidippus tillandsiae Kaston, 1973: 112, figs. 30–33, ♂♀. Holotype ♂ and paratype ♀ in AMNH with labels "Holotype ♂ + allotype ♀, Metaphidippus tillandsiae n. sp., det. by B. J. Kaston (1949)" and "Polluckville, N. C. 24 Oct 26, in Spanish moss," examined. Brignoli, 1983: 644.

Diagnosis. An unusual species with strongly lineate yellow and dark markings on abdomen, living in spanish moss in the southeastern United States. The lack of two distinct rami on the embolus makes its placement in *Pelegrina* problematic.

Male. Palpus (Figs. 225, 473, 474): Embolus narrow and tapering, prolonged beyond opening, lacking two rami. Embolar base bent distally on retrolateral side. *Markings* (Fig. 472): Cheek band dense but narrow. Clypeus with tan hairs, hairs overhanging chelicerae tan. White forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with erect tan hairs on front surface, especially basally. Palpus uniformly light brown to yellow with dark brown cymbium tip. Cymbium with white scales. Legs light brown to yellow, fairly uniform; many specimens with first tarsus dark dorsally. Abdomen shows longitudinal striping of female. *Measurements:* South Carolina: body length 3.7, 3.7, 3.8, 4.2 mm; carapace length 1.7, 1.7, 1.8, 1.9 mm, width/length 0.74, 0.74, 0.75, 0.77; n = 4♂ from Cooper, South Carolina. Florida: body length 3.1, 3.2, 3.2 mm; carapace length 1.4, 1.4, 1.5 mm, width/length 0.74, 0.75, 0.77; n = 3♂ from Florida.

Female. Epigynum (Figs. 254, 475, 476): Flaps pale, only slightly convex. Surface flat. First curve of duct pale; second curve proceeds medially and slightly anteriorly. *Markings* (Fig. 477): Carapace covered with white and some tan scales dorsally, side bands distinct. Clypeus densely covered with white scales. Abdomen with central longitudinal pale stripe flanked by dark stripes flanked by pale stripes. *Measurements:* South Carolina: body length 4.3, 4.4, 4.4, 4.6 mm; carapace length 1.9, 1.9, 2.0, 2.0 mm, width/length 0.76, 0.76, 0.78, 0.78; n = 4♀ from Cooper, South Carolina. Florida: body length 3.6(4.0)4.1 mm; carapace length 1.7(1.7)1.7 mm, width/length 0.75(0.76)0.79; n = 5♀ from Lake Placid, Florida.

Geographical Variation. Specimens from central Florida are distinctly smaller and paler than more northerly specimens and appear more yellow than brown. Males from central Florida have the cymbium yellow with a discrete brown spot at the tip and an embolus that is apparently slightly wider than in northern males.

Distribution (Map 27). North Carolina south to Florida, west to Texas.

Records. UNITED STATES: NORTH CAROLINA: Polluckville, 24 October 1926 (8♂ 5♀, AMNH); SOUTH CAROLINA: Cooper, 25 December 1928 (15♂ 13♀, AMNH); FLORIDA: Lake Placid, Archbold Biological Station, 26 March 1968 (7♀, MCZ) and 1 October 1962 (1♂, AMNH); Mariana, Blue Springs, 12 March 1936 (1♀, AMNH); Ortega (1♂, AMNH); Glades Co.: Fish Eating Creek, 23 February 1951 (1♂, AMNH); MISSISSIPPI: Vancleave, Pascagoula River, Wards Bayou (1♂, AMNH); LOUISIANA: Baton Rouge (1♂ 1♀, MCZ); Tallulah, 9 March 1925 (1♂ 12♀, AMNH); TEXAS: Harris Co.: Clear Lake, nr. Seabrook, 5 December 1958 (1♀, MCZ).

Natural History. Preferred habitat appears to be Spanish moss (*Tillandsia usneoides*; 3 records, and see Kaston, 1973).

37. *Pelegrina bunites* new species
Figures 170, 171, 226, 255, 478–482; Map 30

Holotype male and paratype female in MCZ with label "ARIZONA: Santa Cruz Co., Santa Rita Mts., gate at 26 km of Whipple Obs[ervatory]. Rd. on Mt. Hopkins 7100 ft [2,170 m] el. 17 June 1985 W. Maddison 85-059, beating Cerocarpus montanus."

Etymology. Latinized from the Greek *bounites*, hill-dweller.

Diagnosis. In general appearance, strongly resembles other *Pelegrina* species but lacks the characteristic *Pelegrina* embolus with subterminal opening and two rami. The most distinctive features are the embolus whose erect portion twists and tapers toward tip and the distinct bend on the epigynal flaps. This species is only tentatively placed in *Pelegrina*, for the embolus has its opening terminal and lacks two distinct rami.

Male. Palpus (Figs. 226, 479): Erect portion of embolus twists and tapers toward tip. Embolus with only one ramus near the opening, which is almost terminal. *Markings* (Figs. 170, 478): Carapace side bands and forehead band well developed. Cheek band broad, dense and distinct from side bands. Clypeus brown, with brown to white hairs overhanging chelicerae. Forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae with long medial patch of white scales in Arizona males; Oaxaca male with shorter patch. Cymbium brown, lacking pale scales. Legs mostly beige except for mostly dark brown first pair and brown marking on more posterior pairs. Abdomen brown dorsally with distinct white side bands. *Mesurements:* Body length 3.4, 4.1, 4.4, 4.6 mm; carapace length 1.5(2.1)2.2 mm; width/length 0.77(0.79) 0.81; n = 5♂ from Mount Hopkins, Arizona.

Female. Epigynum (Figs. 255, 480, 481): Flaps thin, depigmented in Arizona females, with distinct bend medially near posterior end, opposite which the epigynum is darkly pigmented. Epigynal surface flat. First curve of duct fairly narrow; second curve proceeds medially. *Markings*

(Figs. 171, 482): Yellow to light brown. Oaxaca females are generally darker than Arizona females. Carapace covered thinly with beige scales. Clypeus covered with white to yellowish scales. Legs more or less uniformly beige to light yellow brown in Arizona females, orange-brown in Oaxaca females. Abdomen often with paired dark spots posteriorly, similar to *insignis*. *Measurements:* Body length 3.6(4.5)4.7 mm; carapace length 1.9(2.0)2.0 mm; width/length 0.76(0.80)0.81; n = 5♀ from Mount Hopkins and Kitt Peak, Arizona.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ from Mount Hopkins, Arizona).

Courtship (3♂ observed from Santa Rita Mtns., Arizona, and near Oaxaca City, Oaxaca). Has crouch display with exaggerated leg waving during pauses. *Raised-spread* (n = 3, 2♂). *Crouch* (n = 7, 3♂): Body held normal to low (n = 2, 2♂) or high (n = 1). First legs forward, spread slightly, horizontal (n = 2, 1♂), or slightly raised (n = 1), or slightly lowered (n = 2, 2♂) flickered rapidly with low amplitude (ca. 5–10°?, [n = 1]) on series (n = 5, 3♂), but waved up and down with higher amplitude (ca. 30°? [n = 1]) ca. 3–7 times (n = 3, 1♂) or a few times (n = 1) during pause (n = 3, 1♂) or at end of series (n = 3, 2♂). During series legs spread slightly but distal segments parallel; during pause legs held wider then parallel (n = 3, 1♂); as he got closer he reached legs to parallel (n = 2, 2♂). Palpi down (n = 2, 2♂) and curled beside chelicerae (n = 1), flickered with low amplitude on series (n = 3, 2♂). Abdomen bobs very little if at all (n = 1). *Repertoires:* 1♂ crouch only, 2♂ raised-spread and crouch.

Distribution (Map 30). Southern Arizona south to Oaxaca.

Records. UNITED STATES: ARIZONA: Santa Rita Mtns., Sweetwater, 1,800 m, 25 June–2 July 1951 (1♀, AMNH); Cochise Co.: Huachuca Mtns., 18 July 1936 (1♀, AMNH); Pima Co.: Quinlan Mtns., picnic area near Kitt Peak Observatory, 1,950 m elevation, 20 June 1985 (4♂ 3♀, MCZ); Madera Canyon, 8 September 1978 (1♀, MCZ); Santa Cruz Co.: Santa Rita Mtns., 2,150 m el. on Whipple Observatory Road, Mt. Hopkins, 17 June 1985 (8♂ 5♀, MCZ). *MÉXICO:* CHIHUAHUA: Pelayo, 101 km W of Santa Barbara, 20 July 1947 (1♀, AMNH); Santa Barbara, 18 July 1947 (1♀, AMNH); DURANGO: 16 km E of El Salto, 8 August 1947 (1♂, AMNH); OAXACA: 50 km NW of Oaxaca on Hwy 190, ca. 97°00′W, 17°14′N, ca. 2,000 m, 6 August 1983 (1♂ 6♀, MCZ).

Natural History. Beating *Cercocarpus montanus* on Mount Hopkins, Arizona; beating pine trees in clearing in oak-pine forest in Oaxaca. At elevations from 1,800 to 2,200 m in Arizona and Oaxaca (4 records).

38. *Pelegrina orestes* new species
Figures 172, 173, 227, 483–487; Map 30

Holotype male and paratype female in MCZ with label "ARIZONA: Santa Cruz Co., upper Madera Canyon, Santa Rita Mts., ca. 5500 ft. [1,680 m] 13 Aug 1983. W. Maddison 83-158 oak woodland, beating oaks, especially Q. hypoleucoides."

Etymology. Greek, mountaineer.

Diagnosis. Resembling the sympatric *verecundus* but larger and more orange; also differing in the more abrupt angle between the erect portion of the embolus and the base. The lack of a second ramus near the embolic opening makes the placement of this species in *Pelegrina* tentative.

Male. Palpus (Figs. 227, 484): Embolus widens abruptly into base on prolateral side to yield a sharp discontinuity between erect portion and base. Embolus with only one ramus retrolateral to opening. *Chelicerae:* Outer edge in some males bears a slight ridge similar to that seen in the *mannii* group. *Markings* (Figs. 172, 483): Indistinct beige marks on brown to orange background. Carapace side bands with extension toward fovea. Cheek band distinct from side band. Clypeus brown, hairs overhanging chelicerae tan to brown. Forehead band does not reach AMEs, so that setae surrounding AMEs are brown above. Chelicerae with small medial patch of pale scales. Cymbium brown, lacking pale scales. Legs beige and brown, with annulate markings. Abdominal dorsum darker than side bands but not distinctly so, dusted with pale scales. *Measurements:* Body length 3.8(4.2)4.8 mm; carapace length 1.8(2.0)2.4 mm; width/length 0.78(0.81)0.84; n = 5♂ from Santa Cruz Co., Arizona.

Female. Epigynum (Figs. 485, 486): Flaps depigmented, convergent; at their posterior end the flaps lie beneath well-pigmented medial rim of opening. Epigynal surface more or less flat. *Markings* (Figs. 173, 487): Pale, yellow-orange, with little hint of markings. Carapace thinly covered with yellow-white scales. Clypeus covered with white scales. Legs more or less uniform beige to light yellow-brown. Abdomen with small speckles somewhat as in *verecundus*, otherwise pale. *Measurements:* Body length 5.0(5.2)5.7 mm; carapace length 2.1, 2.1, 2.2, 2.2 mm; width/length 0.79, 0.79, 0.80, 0.81; n = 4♀ from Santa Cruz and Cochise Co., Arizona.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (2♂ from Madera Canyon, Arizona).

Courtship (3♂ observed from Santa Rita Mtns., Arizona, and near Oaxaca City, Oaxaca). Has crouch display with unusual walking motion. *Raisedspread* (n = 3, 1♂). *Crouch* (n = 11, 3♂): Body normal height (n = 8, 2♂). First legs bowed and forward (n = 10, 2♂). At distance: legs below horizontal with tips on ground (n = 8, 2♂); flickered while walking to yield strange combined motion (n = 6, 2♂). Within 1–2 body lengths: first legs off ground to horizontal and no longer involved in walking, flickered with low amplitude during series, still during pause (n = 8, 3♂). Palpi down (n = 5, 3♂), and curled to side of chelicerae (n = 1); flickered during series, still during pause (n = 6, 2♂). *Repertoires:* 2♂ crouch only, 1♂ raisedspread and crouch.

Distribution (Map 30). Southern Arizona to Oaxaca.

Records. UNITED STATES: ARIZONA: Cochise Co.: Cave Creek Canyon, above Portal, 9 June 1977 (1♂, MCZ); Chiricahua Mtns., South Fork Cave Creek, 13 June 1958 (2♂, AMNH); Chiricahua Mtns., July 1985 (1♀, AMNH); Santa Cruz Co.: Santa Rita Mtns., Madera Canyon nr. Bog Springs Cmpgd., 13 August 1983 and 17 June 1985 (6♂ 3♀, MCZ); Madera Canyon, 16–24 July 1951 (1♂, AMNH). *MÉXICO:* CHIHUAHUA: Canon Prieta nr. Primavera, 30 June 1947 (1♂, AMNH); OAXACA: 39 km NW of Oaxaca on Hwy 190, ca. 96°57′W, 17°17′N, 6 August 1983 (1♂, MCZ).

Natural History. At Madera Canyon in Arizona, beating oaks, especially *Quercus hypoleucoides*, in oak woodland. Also collected from oaks at other localities (2 records, Arizona and Oaxaca). Collected from 1,200 to 1,900 m elevation in Arizona and Oaxaca (5 records). At Madera Canyon, this species was common in August (5♂ 3♀) but rare in June (1♂).

THE GENUS *NAGAINA* G. & E. PECKHAM, 1896

This genus has received little attention, but its type species (by monotypy), *N. incunda*, is a common Central American species that has usually gone by different names (e.g., *Metaphidippus flavolineatus*). It is described here to resolve the taxonomic confusion surrounding it and because it may be confused for sympatric *Pelegrina* species. The status of the genus *Nagaina* awaits further study. As noted in the discussion of the *mannii* group, *N. incunda* resembles species of both the *mannii* group and the genus *Eris*, but the shared characteristics may be plesiomorphies. It is also not clear whether or not the other species described in the genus (*N. diademata* Simon, *N. tricincta* Simon, *N. modesta* di Caporiacco, *N. berlandi* Soares & Camargo, *N. olivacea* Franganillo) belong with *N. incunda*.

39. *Nagaina incunda* G. & E. Peckham, 1896
Figures 174, 175, 228, 488–492;
Map 37

Nagaina incunda G. & E. Peckham, 1896: 55, pl. 4, figs. 10, 10a–c, ♀. Holotype in MCZ 1♀ with label "883 Nagaina incunda Peck, Guatemala ♀ 4312 Type, G. W. & E. G. Peckham Coll." (in Bryant's handwriting), from the east coast to Guatemala (G. & E. Peckham, 1896), examined. Roewer, 1954: 1022. Bonnet, 1958: 3027.

Dendryphantes vegetus G. & E. Peckham, 1901b: 323, pl. 28, figs. 7, 7a, ♀. Types in MCZ 24♀ 5 im. with labels "476 Dendryphantes vegetus Peck. Type, Mexico; San Rafael ♀ 4132, G. W. & E. G. Peckham Coll." (in Bryant's handwriting), examined. Roewer, 1954: 1201. Bonnet, 1957: 2818. NEW SYNONYMY.

Metaphidippus flavolineatus F. P.-Cambridge, 1901: 268, pl. 24, figs. 9, 9a–c, ♂. Types in BMNH 3♂ with labels "Philaeus flavolineatus, F. Cb., Type ♂. Panamá, Bugaba (Champion)" and "1905., 265.", examined. NEW SYNONYMY.

Metaphidippus expallidatus F. P.-Cambridge, 1901: 270, pl. 24, figs. 18, 18a, ♀. Holotype in BMNH 1♀ with labels "Dendryphantes expallidatus, sp. n. Type ♀, Panamá - Bugaba (Champion)" and "1905, 241," examined. Roewer, 1954: 1193. Bonnet, 1957: 2812. NEW SYNONYMY.

Beata flavolineata:—Simon, 1903: 838. Roewer, 1954: 1007. Bonnet, 1955: 873.

Diagnosis. The male is distinctive for its brown and yellow striped markings. The female is mostly orange-yellow; most distinctive are the dark spots under the AMEs and on the chelicerae, and the narrow subterminal dark annuli on the first leg segments, most unusual on the femur, and the bicuspid tooth.

Male. Palpus (Figs. 228, 489): Embolus much as in *mannii* group, thin and curving somewhat ventrally at tip. Embolar base shoulder usually weaker than in figure. *Markings* (Figs. 174, 488): Body brown with markings of yellow scales. Carapace with large yellow forehead spot and side bands extending broadly onto cheek area. Clypeus mostly covered with yellow scales, including prominent patch between AMEs overhanging chelicerae, but immediately beneath AMEs scales are usually absent. Forehead band contacts AMEs dorsally 10:00–12:30. Chelicerae lacking yellow scales. Basal segments of palpus pale yellow; tibia and cymbium dark brown and lacking pale scales. First legs brown; posterior legs yellow, in some specimens with longitudinal lark lines. Abdomen brown with yellow side bands and central longitudinal stripe. *Measurements:* Body length 3.0(3.5)4.0 mm; carapace length 1.5(1.7)1.9 mm; width/length 0.76(0.80)0.85; n = 5♂ from Veracruz, Oaxaca, and Quintana Roo.

Female. Epigynum (Figs. 490, 491): Epigynal flaps very weak, somewhat convergent, only slightly pigmented. Epigynal surface more or less flat. *Markings* (Figs. 175, 492): Carapace covered with yellow scales. Clypeus dark below AMEs, lacking scales, just above vertical dark line on each chelicera, but between AMEs a triangular patch of yellow scales projects from clypeus over chelicerae as in male. Legs yellow, with distinctive narrow, dark, subterminal annulus on first femur, patella and tibia, though annulus may be lacking on one or more of these segments. Abdomen orange-yellow, sometimes with indistinct brown markings. Bicuspid tooth on retromargin of chelicera. *Measurements:* Body length 3.5(3.9)4.3 mm; carapace length 1.4(1.6)1.7 mm; width/length 0.78(0.78)0.79; n = 5♀ from Quintana Roo, Chiapas, and Tamaulipas.

Courtship (3♂ observed from Las Abritas, San Luis Potosi). With crouch display as in *Eris* and *Pelegrina*. In both raised-spread and crouch displays the male walked in an unusual seemingly nervous walk in which the body and appendages vibrate together at low amplitude (n = 10, 3♂). *Raisedspread* (n = 8, 3♂): Body high (n = 2, 2♂). First legs raised and spread wide (n = 5, 1♂). Palpi down (n = 3, 2♂). First legs and palpi motionless except for vibration and walking motion (n = 7, 3♂). Abdomen depressed (n = 2, 2♂), trails a bit (n = 4, 1♂). Gradually, male moved into crouch stage. *Crouch* (n = 10, 3♂): Body held high (n = 2, 1♂) or normal (n = 4, 2♂) or normal-low (n = 4, 1♂). First legs forward and horizontal (n = 10, 3♂), slightly spread (n = 9, 2♂). Except for the vibration, the first legs were still (n = 10, 1♂). Palpi down and forward (n = 10, 3♂); wave occasionally (n = 1). Abdomen horizontal (n = 10, 3♂).

Distribution (Map 37). México south to Panamá.

Records. *MÉXICO:* TAMAULIPAS: nr. Gomez Farias 99.1°W, 23.1°N (1♀, MCZ); SAN LUIS POTOSÍ: 16 km SW of Tamazunchale, 98°53′W, 21°11′N (1♂, MCZ); 1 km E of Las Abritas on Hwy 80, 99°23′W, 22°29′N (1♂, MCZ); Xilitla (3♂ 2♀, MCZ); VERACRUZ: Estacion de Biologia Tropical "Los Tuxtlas," 95°07′W, 18°36′N (2♂, MCZ); San Andres Tuxtla, 95°13′W, 18°26′N (1♀, MCZ); OAXACA: 17 km SW of Valle Nacional, 96.4°W, 17.6°N (3♂, MCZ); Temascal, 96°25′W, 18°14′N (1♀, MCZ); QUINTANA

ROO: 31 km NE of Felipe Carrillo Puerto, 87°52′W, 19°48′N (1♀, MCZ); Kohunlich ruins, 88°48′W, 18°26′N (2♂ 3♀, MCZ); CHIAPAS: Palenque ruins, 92°01′W, 17°29′N (3♀, MCZ); 77 km SE of Palenque on road to Bonampak 91.5°W, 17.1°N (4♂, MCZ); 105 km SE of Palenque on road to Bonampak, 91.3°W, 17.0°N (1♂ 2♀, MCZ); 76 km S of Palenque on road to Ococingo, 92.2°W, 17.1°N (4♂, MCZ). *NICARAGUA:* San Marcos (3♂, MCZ). *PANAMÁ:* Boquete (10♂, MCZ).

Natural History. Common in the tropical lowlands of México, in vegetation along roadsides, and in other disturbed habitats.

SPECIES OF THE *MANNII* GROUP OF THE UNITED STATES AND CANADA

Probably closely allied to *Pelegrina* is the *mannii* group, which occurs in western North America and includes a number of small to medium-sized species (*Metaphidippus mannii, M. diplacis, M. tricolor, M. chera, M. bispinosus, M. carmenensis, M. lanceolatus,* and *M. emmiltus*). Their markings are much as in *Pelegrina* species, except that the forehead band does not contact the AMEs (except in *M. emmiltus* males from California) and in many species the cheek band is not distinct from the side band. The chelicerae of males of several species have large patches of pale scales, distinguishing them from most *Pelegrina* species north of México. The embolus tip is narrower and lacks the two rami seen in most *Pelegrina* species. The epigynal flaps are narrow, flat, and descend into the openings.

The exact limits of the group, and whether or not it should be included within *Pelegrina*, are difficult to determine. One character that may delimit a group is the prominent ridged bulge on the distal lateral surface of the chelicerae of males (Fig. 493), though it is lacking in *M. emmiltus.* In those species listed above, including *M. emmiltus* though perhaps not in *M. lanceolatus*, there is also a bulge just dorsal to the base of the tibial apophysis (Fig. 515). This bulge is absent in *Pelegrina*, including *P. orestes* and *P. bunites*, *Eris, Nagaina*, and other dendryphantines examined. As already noted, there are two species placed in *Pelegrina, P. bunites* and *P. orestes* that may rather belong to the *mannii* group. Tentatively, the *mannii* group is considered to exclude these. Described here are the six *mannii* group species occurring in the United States and Canada: *mannii, diplacis, tricolor, chera, carmenensis,* and *emmiltus.*

The *mannii* group shares with *Pelegrina* the distinct male cheek bands, the crouch display in courtship, and a very similar general appearance. Indeed, *Metaphidippus mannii* and *Pelegrina aeneola* are often confused by inexperienced workers. However, the cheek bands are often not distinct in the *mannii* group, the crouch display is also seen in other dendryphantines, and the *mannii* group also shows similarities to other genera such as *Nagaina* and *Eris* (including *Paraphidippus*) in having a relatively robust carapace and a simple embolus whose distal portion is a simple erect spike. One might be tempted to combine all these into the genus *Eris*, but the robust carapace and simple embolus are probably primitive for a large group of dendryphantines, and thus the genus would probably not be monophyletic. A new genus might be described for the group, but it seems too likely that it would soon fall into synonymy with *Pelegrina, Eris, Nagaina*, or some other existing genus (in this respect the *mannii* group is unlike *Terralonus* and *Ghelna*, which seem unlikely to find older synonyms in the near future). I have therefore chosen, with some reluctance, to leave the *mannii* group in *Metaphidippus*, with the understanding that it is looking for another home.

40. *Metaphidippus mannii* (G. & E. Peckham, 1888)

Figures 178–181, 229, 230, 256, 493–502; Map 31

Attus imperialis G. & E. Peckham, 1888: 44, pl. 3, figs. 31, 31a, ♂. Types in MCZ 2♂ with labels "Attus imperialis Pkm. 1888. California. Type ♂." (label is original; handwritten, probably by Elizabeth

Peckham) and "G.W. Peckham Coll.", examined. Both ♂ lack palpi; 1 is a ♂ *mannii*, other is *diplacis*; the Peckhams' description indicates *mannii*. (Junior primary homonym of *Attus imperialis* Rossi.)

Dendryphantes manii G. & E. Peckham, 1901b: 326, pl. 28, figs. 1, 1a, ♂. Holotype in MCZ 1♂ with labels "Dendryphantes Mannii Pkm 1901. Arizona. Type. ♂." (label is original; handwritten, probably by Elizabeth Peckham) and "G.W. Peckham Coll.", examined.

Dendryphantes manni:—Roewer, 1954: 1212.

Dendryphantes imperialis:—G. & E. Peckham, 1909: 459, pl. 37, figs. 2b–d and possibly 2a, ♂.

Dendryphantes versicolor G. & E. Peckham, 1909: 475, pl. 36, figs. 6, 6a, ♀. Types in MCZ 5♀♀ with labels "Dendryphantes versicolor P. ♀ Salem Oregon Type" (label is original; handwritten, probably by Elizabeth Peckham) and "G. W. Peckham Coll.", examined. Roewer, 1954: 1216. NEW SYNONYMY.

Dendryphantes diplacis:—Chamberlin, 1924, in part: 686 (Arizona paratype).

Metaphidippus imperialis:—Gertsch, 1935: 29. Bonnet, 1957: 2814.

Metaphidippus versicolor:—Bonnet, 1957: 2818.

Notes on Synonymy. G. E. Peckham (1901b) described *mannii* as having yellow legs and palpi with restricted brown markings and extensive white on the side of the carapace, and they figured a narrow embolus with the embolic base rounded retrolateral to the erect portion of the embolus; in these respects, the description seems to match *chera* better than the species here considered *mannii*, but the specimen labeled as type is clearly of the species described here as *mannii*. Though in 1901 the Peckhams spelled the name *manii*, the collector's name (Mann) and their subsequent spelling (1909) indicate their intention to spell the name *mannii*.

Diagnosis. The common species of oak woodland of the Pacific coastal United States. Dense white patches on chelicerae and cheek bands that contrast against a dark, shiny body distinguish males immediately. The smooth carapace, weak epigynal flaps, and orange scales between the AMEs distinguish females from Pacific Coast *Pelegrina*. Epigynal flaps shorter than in *diplacis*, more robust than in *chera* and *carmenensis*. Female markings less longitudinally arranged than in *diplacis* and *tricolor*, usually darker than *carmenensis* and *chera*.

Male. Palpus (Figs. 23, 229, 230, 494, 498, 499): Embolus more or less straight; blade-shaped, fairly thin and triangular viewed ventrally but wide when viewed laterally. Base of embolus sclerotized along retrolateral margin and, especially in Arizonan males (Fig. 230), extended into prong. *Markings* (Figs. 178, 180, 493): Carapace dark, side bands generally absent or much reduced (Figs. 178, 493) except in Arizona (Fig. 180). Cheek band dense and white, makes striking contrast against dark body. Clypeus brown. Forehead band absent. Setae surrounding AMEs dark except white laterally. Chelicerae with dense patch of white scales. Palpus medium to dark brown with discrete white band across the distal end of the femur. Cymbium brown, lacking white scales. Legs light to medium brown with darker but indistinct annulae. Abdomen side bands often incomplete posteriorly. *Measurements:* Body length 3.5(4.2)4.8 mm; carapace length 1.7(1.9)2.2 mm; width/length 0.78(0.81)0.85; n = 5♂ from California.

Female. Epigynum (Figs. 256, 495, 496, 500, 501): Flaps dark, narrow and flat. Epigynal surface more or less flat. *Markings* (Figs. 179, 181, 497, 502): Except in Arizona, carapace shiny brown, because integument smooth and transparent bronze scales usually dominate cephalic area. Clypeus covered with white scales, but at least in coastal females the area between the AMEs is covered with orange scales. Legs with light to dark brown markings in coastal females, not distinctly annulate. Abdomen in coastal females brown with prominent paired dark spots; Arizona females may have the abdomen partly covered with yellow scales. *Measurements:* Body length 4.3(4.5)4.9 mm; carapace length 1.9(1.9)2.0 mm; width/length 077(0.79)0.80; n = 5♀ from California.

Geographical Variation. Two distinct forms might be recognized, an inland form (*mannii s.s.*, in Arizona; Figs. 180, 181, 230, 498–502) and a coastal form (*versi-

color, from California to British Columbia; Figs. 178, 179, 229, 493–497). In the coastal form, males are dark brown and generally lack white side bands on the carapace, and the retrolateral side of the base of embolus is little if at all prolonged into a spike. Females are medium to dark brown and have more or less parallel epigynal flaps. In the inland form, males have dense white side bands on the carapace, the retrolateral portion of embolar base prolonged into a pronounced spike, almost as in *diplacis* though projecting more parallel to axis of palpus. Arizona females are often covered with yellow scales (and could be confused with *chera* except for their stronger epigynal flaps) and have more robust and divergent epigynal flaps. A variable population including pale and dark ♀♀ has been found near Tuscon, Arizona. Until better evidence is found to distinguish them, the two forms will be considered as one species.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (2♂ from Apple Canyon, Riverside Co., California).

Courtship (5♂ observed from near Nogales, Arizona, and Riverside Co., California). Males of both the inland form (Arizona) and the coastal form (California) have a typical crouch display. *Raisedspread* (n = 7, 3♂). *Crouch* (Arizona: n = 9, 3♂; California: n = 13, 2♂): Body low (n = 7, 3♂). First legs forward and bowed, horizontal (n = 18, 4♂) or raised (n = 1), on series flickered legs with high frequency (n = 13, 2♂) low amplitude (n = 19, 4♂) while legs are pushed a bit closer together (n = 6, 2♂) or not (n = 3, 1♂). First legs moved closer as he got closer (n = 13, 2♂) until tips almost touching (n = 10, 1♂), legs motionless on pause (n = 3, 1♂). Palpi hanging extended forward, down and to side (n = 1, 3♂), or just hanging down to side (n = 3, 1♂); on series flickering slightly (n = 22, 5♂) at high frequency low amplitude (n = 13, 2♂), or only slightly as palpi pushed forward (n = 3, 1♂), palpi motionless on pause (n = 6, 2♂). *Repertoires:* 2♂ crouch only; 3♂ raisedspread and crouch.

Distribution (Map 31.) British Columbia south to Baja California and east to central Arizona.

Records. Many specimens, especially in CAS, AMNH, and MCZ: Form *mannii*: *UNITED STATES:* UTAH: Zion National Park (1♂); ARIZONA: Cochise Co.: Chiricahua Mtns. (1♀); Coconino Co.: Mormon Lake (1♀); Pima Co.: Santa Catalina Mtns., 12.7 km from Tuscon on Catalina highway toward Mt. Lemmon (8♀); Tuscon (1♀); Santa Cruz Co.: Sycamore Canyon, 14 km W Peña Blanca Lake (5♂ 8♀); 1.6 km S of Peña Blanca Lake (1♂). Form *versicolor: CANADA:* BRITISH COLUMBIA: Vancouver Island: Wellington, Mt. Benson. *UNITED STATES* (county records): WASHINGTON: Asotin, Chelan, King, Klickitat, Thurston, Whatcom, Whitman; IDAHO: Adams, Lemhi; OREGON: Benton, Douglas, Hood River, Jackson, Josephine, Klamath, Lane, Malheur, Marion, Multnomah, Polk; CALIFORNIA: Alameda, Amador, El Dorado, Fresno, Kern, Humboldt, Lake, Los Angeles, Marin, Mariposa, Mendocino, Monterey, Placer, Plumas, Riverside, San Benito, San Bernardino, San Diego, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Shasta, Siskiyou, Solano, Stanislaus, Trinity, Tulare, Ventura, Yuba; *MEXICO:* BAJA CALIFORNIA: 12 km S Santo Tomás.

Natural History. Form *versicolor* collected from oaks (9 records), including *Quercus agrifolia, Q. douglasi, Q. kelloggii,* and *Q. wislezenii, Arctostaphylos* (4 records), pine (2 records), and one record each from *Ribes*, willows, *Adenostema*, holly, and raspberry, at elevations from 15 to 100 m (8 records), 100 to 1,000 m (8 records), and 1,000 to 1,500 m (5 records). Form *mannii* collected from oaks (5 records) and *Cerocarpus* (1 record), at elevations from 1,200 to 1,700 m (4 records).

41. *Metaphidippus diplacis* (Chamberlin, 1924)

Figures 182, 183, 231, 503–508; Map 33

Dendryphantes diplacis Chamberlin, 1924: 686, figs. 130–132, ♂. Holotype in MCZ 1♂ with label "Dendryphantes diplacis Chamb., ♂ holotype [in faded red ink], Cal.: near San Diego, R. V. Chamberlin Coll. 1049," examined. Roewer, 1954: 1193. Bonnet, 1956: 1393.

Metaphidippus franciscanus Schenkel, 1951: 39, figs. 42a, b, ♀. Type material in Naturhistorisches Museum, Basel, from Mission Bay near San Diego, California. NEW SYNONYMY.

Dendryphantes franciscanus:—Roewer, 1954: 1210.

Metaphidippus diplacis:—Richman and Cutler, 1978: 89.

Notes on Synonymy. (1) The type material of *M. franciscanus* Schenkel remains to be examined; however, the synonymy is clear on the basis of his description and subsequent collecting at Mission Bay, where *M. diplacis* is very common. (2) The Peckhams' (1909) figures of the female of *Dendryphantes imperialis* (pl. 37, figs. 2, 2a) may actually be of *M. diplacis.*

Diagnosis. Among specimens of the *mannii* group collected along the Pacific Coast, only *M. diplacis* has the retrolateral basal edge of the embolus so prolonged (though inland *M. mannii* are similar in this). *Metaphidippus diplacis* males differ from *mannii* in having more extensive side bands and much weaker white patches on the chelicerae; females by the more lineate abdominal markings and the longer epigynal flaps. *Metaphidippis diplacis* can be separated from the more northerly but similar *tricolor* by the wider embolus, more robust tibial apophysis, the shinier body in both sexes, and the more extensive white markings in males, and darker epigynal flaps.

Male. Palpus (Figs. 231, 504, 505): Embolus blade-shaped, thin in ventral view and wide in lateral. Embolic base with sclerotized retrolateral projection. Tibial apophysis robust. *Markings* (Figs. 182, 503): Body brown, with bronze sheen. White carapace side bands extending backward almost to posterior margin. Cheek band broad and short, mostly fused with side band. Clypeus brown. Forehead band lacking or rudimentary. Setae surrounding AMEs dark except for a few white scales laterally. Chelicerae with patch of pale scales restricted to basal half, as in *tricolor,* but generally white. Palpus brown with scattered white setae near end of femur. Abdomen brown dorsally with paired dark brown spots forming two longitudinal lines; side bands complete. *Measurements:* Body length 3.5(4.4)4.6 mm; carapace length 1.9(2.1)2.2 mm; width/length 0.77(0.80)0.81; n = 5♂ from California.

Female. Epigynum (Figs. 506, 507): Flaps usually at least half as long as epigynum, generally longer than other *mannii* group ♀♀. Epigynal surface more or less flat. Notch usually narrow. *Markings* (Figs. 183, 507, 508): Carapace orange-brown with bronze scales, covered with yellowish white scales densest on upper sides, giving hint of side bands as in ♂. Clypeus covered densely with white scales; between anterior eyes are usually orange-brown setae. Abdomen with somewhat lineate markings, with pale medial band flanked by light brown with paired elongate dark spots. *Measurements:* Body length 5.0(5.3)6.2 mm; carapace length 2.0(2.1)2.3 mm; width/length 0.78(0.79)0.80; n = 5♀ from California.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (2♂ from San Diego, California).

Courtship (2♂ observed from San Diego and Santa Barbara Cos., California). No apparent crouch display seen. *Raisedspread* (n = 24, 2♂): First legs waving irregularly (n = 8, 1♂) up and down (n = 8, 2♂) with high amplitude (n = 5, 1♂). Palpi waving at low amplitude and irregularly (n = 5, 1♂). Abdomen horizontal (n = 5, 1♂) or down and trailing (n = 3, 1♂). As he got closer legs gradually lowered into reach with no discrete crouch display (n = 21, 2♂). *Reach* (n = 8, 2♂): Short stage with gradual transition from raisedspread (not discrete crouch) (n = 8, 2♂). First legs forward and parallel, waving alternately but irregularly (n = 5, 1♂). Palpi forward (n = 5, 1♂). *Repertoires:* 2♂ raisedspread only.

Distribution (Map 33). Pacific Coast of southern California and Baja California Norte.

Records. UNITED STATES: CALIFORNIA: Los Angeles Co.: South Huntington Beach (1♂, AMNH); Orange Co.: Laguna Beach 117.47/33.33 (1♂, AMNH); San Diego Co.: E of Lake Hodges, Escondido (1♀, MCZ); Oceanside (2♀, MCZ); San Diego, Mission Bay, Fiesta Island (4♂ 21♀, MCZ; 2♂ 2♀, UCB); near San Diego (6♂, MCZ); San Luis Obispo Co.: Pismo Beach (1♂, UCB); Santa Barbara Co.: NW edge of El Estero marsh just E of Carpinteria (1♂ 5♀, MCZ); Gaviota (2♀, AMNH); Goleta (1♂, AMNH). *MÉXICO:* BAJA CALIFORNIA NORTE: Arroyo Soccorro dunes, S of San Quintin (1♀, UCB); El Rosario (2♀, AMNH); Ensenada (1♂, AMNH); Rancho Las Parritas, 16 km S of San Quintin (4♂ 3♀, UCB); Santa María, 37 km S of Colonia Guerrero (1♀, AMNH); San Telmo de Arriba (1♀, AMNH); Santo Tomás (1♀, AMNH).

Natural History. On *Baccharis* (3 records, Fiesta Island, San Diego) and dunes (2 records, BCN). Appears to be restricted to localities near the seashore; not found so far inland as *mannii.*

42. *Metaphidippus tricolor* Chamberlin & Ivie, 1941

Figures 184, 185, 232, 509–513; Map 32

Metaphidippus tricolor Chamberlin and Ivie, 1941: 29, figs. 30–32, ♂. Type in AMNH 1♂ from 122°5′W, 37°5′N, Ben Lomond, California.

Dendryphantes iviei Roewer, 1951: 453 (n. nov. for *tricolor* Chamberlin and Ivie, junior secondary homonym of *Plexippus tricolor* C. L. Koch, 1846, both placed in *Dendryphantes* by Roewer). Roewer, 1954: 1212.

Notes on Synonymy. The name *tricolor* is maintained despite the ICZN's rule (1985 code Art. 59(b)) that junior secondary homonyms rejected before 1961 must remain rejected. The placement of almost all New World dendryphantines into *Dendryphantes* was a practice mostly of cataloguers (Petrunkevitch, 1911; Roewer, 1954) and not of practicing North American systematists. Roewer's new name and the placement of the two *tricolors* together in *Dendryphantes* are better considered temporary anomalies rather than long-accepted changes that need to be protected by the code, for neither his new name *iviei* nor its placement in *Dendryphantes* have been since accepted (e.g., Richman and Cutler, 1978). *Plexippus tricolor* C. L. Koch, at least by Koch's figures, appears to be near *Eris aurantia* and, thus, not now considered congeneric with the *mannii* group. Until a generally accepted secondary homonymy occurs, it serves little purpose to allow Roewer's changes to return and haunt us, and so *tricolor* Chamberlain & Ivie will be maintained.

Diagnosis. A dark species restricted to the coast of central and northern California, in some respects intermediate between *diplacis* and *chera.* Whether or not *tricolor* grades into *diplacis* in the south is not now clear. Females are notable for their lineate markings; males for the dark face.

Male. Palpus (Figs. 232, 510): Embolus narrow, though slightly wider than in *chera,* and sclerotized retrolateral projection on embolar base better developed. Tegulum bulbous prolaterally, in which respects it approaches *diplacis. Markings* (Figs. 184, 509): Body dark brown with white side bands often poorly developed. Cheek band broad but weak, fused to side band. Clypeus brown. Forehead band lacking. Setae surrounding AMEs dark except for a few white scales laterally. Chelicerae with inconspicuous orange-brown patch of pale scales restricted to basal half. Palpus dark, with few white scales and none on cymbium. Legs dark, with indistinct annulations. Abdomen brown dorsally with two longitudinal dark bands. *Measurements:* Body length 3.5(4.1)4.6 mm; carapace length 1.7(1.9)2.3 mm; width/length 0.80(0.80)0.82; n = 5♂ from Monterey Co., California.

Female. Epigynum (Figs. 511, 512): Flaps long, lightly pigmented. Epigynal surface more or less flat. First curve of ducts long, pale. Notch broad. *Markings* (Figs. 185, 513): Body scales dull, not shiny as in *diplacis.* Carapace surface not as shiny as *mannii,* with brown or gray scales above, darker than *chera.* Clypeus densely covered with white scales; between anterior eyes are orange-brown setae. Abdominal markings strikingly linear, central pale stripe flanked by black stripes flanked by lateral pale stripe. *Measurements:* Body length 4.3(5.2)5.4 mm; carapace length 1.9(1.9)2.0 mm; width/length 0.78(0.79) 0.82; n = 5♀ from Monterey Co., California.

Chromosomes. 2n♂ = ? + XXO (2♂ from Lucia, California).

Courtship (2♂ observed from Monterey Co., California). With typical crouch display. *Raisedspread* (n = 7, 2♂). *Crouch* (n = 6, 3♂): Body low-normal (n = 5, 2♂). First legs forward and horizontal (n = 6, 3♂), spread slightly (n = 1), or bowed (n = 5, 2♂) though may sometimes be raised (n = 4, 1♂); waved little if at all (n = 3, 1♂) or tips of legs flickered at high frequency low amplitude (n = 2, 1♂). Palpi down (n = 3, 1♂) waved/flickered on each series (n = 6, 3♂) rapidly (n = 2, 1♂). *Repertoires:* 1♂ raisedspread only, 2♂ crouch only, 1♂ raisedspread and crouch.

Distribution (Map 32). Pacific Coast of central and northern California.

Records. UNITED STATES: CALIFORNIA: Marin Co.: Pt. Reyes (1♂ 2♀, UCB); North Beach, Pt. Reyes National Seashore (2♂ 4♀, MSUW, UCB); Monterey Co.: Hastings Natural History Reserve (1♂ 1♀, AMNH); 12.2 km N of Lucia on Hwy 1 (7♂ 9♀, MCZ); on Nacimiento–Fergusson Road 0.3–1.4 km from Hwy 1 (1♂ 2♀, MCZ); ocean-facing slopes of Santa Lucia Mtns., 5 km NW of San Luis Obispo State Border on Hwy 1 (1♂ 2♀, MCZ); Pacific Grove, 121.55°W, 36.38°N (1♀, AMNH); Pebble Beach (1♀, AMNH); 8 km N of Point Sur (1♂, AMNH); Santa Cruz Co.: Ben Lomond, 122.05°W, 37.05°N (2 imm, AMNH); Trinity Co.: 72 km W of Redding (1♂, AMNH).

Natural History. On *Baccharis* and other shrubs in coastal scrub (4 records, Monterey Co.) and from *Lupinus* on beach (2 records, Marin Co.).

43. *Metaphidippus chera* (Chamberlin, 1924) new combination

Figures 33, 186, 187, 233, 257, 514–528; Map 35

Dendryphantes chera Chamberlin, 1924: 683; fig. 124, ♀, Holotype in CAS 1♀ with labels "Dendryphantes chera Chamb., ♀ type, San Joseph Id. 6/10/21, 165 J. C. Chamberlin" and "1462," examined. Chamberlin cites the type locality as San Josef Island, Gulf of California. I interpret this as San José Island, Baja California Sur. Roewer, 1954: 1192. Bonnet, 1956: 1393.

Metaphidippus manni:—Carpenter, 1972: 163. Richman and Roth, 1976: 201. Gertsch and Riechert, 1976: 7.

Diagnosis. One of the most common salticids in the southwestern United States and northern México, this species is usually identified as *mannii. Metaphidippus chera* can be easily distinguished from *mannii,* as well as from *diplacis* and *tricolor,* in having much more extensive pale markings, annulate legs in males, a narrower embolus, narrower tegulum, thinner tibial apophysis, and weaker, shorter, and depigmented epigynal flaps. The female abdominal markings are never so lineate as in *tricolor*. The scales covering the female carapace are not shiny as in *mannii* or *diplacis,* nor as dark as *tricolor. Metaphidippus chera* is perhaps most likely confused with *carmenensis* but differs in having the embolus straighter in retrolateral view, and the left and right epigynal ducts meeting at midline before going posteriorly. Though the male is easily distinguished from that of *emmiltus* by markings and cheliceral size, the female is much like that of *emmiltus* but the epigynal ducts are wider and meet at midline before going posteriorly.

Male. Palpus (Figs. 33, 233, 515–523): Embolus thin and straight; usually lacking sclerotized projection on retrolateral side of base embolar base, though this varies considerably (Figs. 518–523). Tegulum fairly narrow, not bulbous prolaterally. *Markings* (Figs. 186, 514): Carapace with strong side bands often with thoracic projections toward fovea. Cheek band usually distinct from side band. Clypeus with orange-brown scales; some white setae overhanging chelicerae. Forehead band does not reach AMEs; setae surrounding AMEs orange-brown except laterally. Chelicerae with prominent white patch extending usually more than half length of chelicerae. Cymbium dark brown, often with a few white scales. Legs strongly annulate. Abdomen with strong side bands; dorsally variable as in females, either solid light brown or with brown spots, which are sometimes fused into longitudinal dark bands flanking central pale stripe. *Measurements:* Body length 3.4(4.3)4.8 mm; carapace length 1.6(2.0)2.3 mm; width/length 0.81(0.82)0.84; n = 5♂ from New Mexico.

Female. Epigynum (Figs. 257, 524–526): Flaps depigmented and short. Epigynal surface flat. Ducts meet at midline at junction of second and third curves. *Markings*

(Figs. 187, 527, 528): Very variable, in some populations solid yellow, in others darker with annulate legs and dotted or somewhat lineate abdominal markings. Carapace covered with mostly white to yellow-white scales, not shiny. Clypeus covered densely with yellow-white scales. Legs uniformly yellow to strongly annulate. Abdomen sometimes entirely yellow, otherwise variously marked (Figs. 187, 527, 528). *Measurements:* Body length 3.4(4.1)5.0 mm; carapace length 1.6(1.8)2.0 mm; width/length 0.79(0.79)0.84; n = 5♀ from New Mexico.

Chromosomes. 2n♂ = 26 acrocentrics + XXO (1♂ from Imperial Dam, California).

Courtship (14♂ observed from Texas, New Mexico, Arizona, California, Nuevo León, San Luis Potosí, and Zacatecas). With strong crouch display. A brief description of the courtship was given by Richman (1982: 38, figs. 1–3), under the name *Metaphidippus manni. Raisedspread* (n = 6, 2♂). *Crouch* (n = 28, 13♂). Body raised slightly (n = 6, 3♂) or low (n = 2, 1♂) or at normal height (n = 3, 1♂). First legs forward, spread wide (n = 12, 5♂), even greater than 90° apart, especially when male at a distance (n = 6, 2♂) to more or less parallel (n = 9, 3♂), especially when close to female (n = 6, 2♂). First legs horizontal (n = 20, 10♂), sometimes with tips on ground (n = 3, 1♂), or slightly raised (n = 7, 3♂). On series, legs flickered (n = 17, 9♂) with low amplitude (n = 10, 5♂) and high frequency (n = 3, 1♂); on pause, legs motionless (n = 17, 9♂). On series, legs pushed medially together (n = 7, 4♂), raised slightly (n = 3, 2♂), and pushed forward (n = 2, 1♂). Sometimes legs not raised (n = 1) or not pushed together, rather kept parallel (n = 4, 2♂), espeically when close to female (n = 2, 1♂). Sometimes legs held slightly asymmetrically, one more extended than other (n = 2, 1♂). Palpi down (n = 9, 5♂), and over chelicerae (n = 1) or curled to side (n = 1), on each series pushed forward (n = 10, 4♂) and waved (n = 21, 10♂), up and down (n = 5, 3♂); still on pause (n = 21, 10♂). Abdomen bobbed occasionally (n = 4, 2♂), specifically after series (n = 1), sometimes trailed a bit on sidles (n = 2, 2♂). *Repertoires:* 1♂ raisedspread only, 12♂ crouch only, 1♂ raisedspread and crouch.

Distribution (Map 35). Texas west to California, Nevada south to Baja California del Sur and San Luis Potosí.

Records. Many specimens in AMNH, MCZ, UCB, and MSU, from: *UNITED STATES* (county records): OKLAHOMA: Jefferson; TEXAS: Archer, Baylor, Bexar, Foard, Haskell, Presidio, Reagan, Wichita, Winkler; UTAH: Washington; NEVADA: Churchill; NEW MEXICO: Doña Ana, Lincoln; ARIZONA: Cochise, Coconino, Graham, Maricopa, Mohave, Pima, Santa Cruz, Yavapai, Yuma; CALIFORNIA: Fresno, Imperial, Inyo (nr. Bishop), Kern, Los Angeles, Mono, Riverside, Santa Barbara, San Benito, San Bernardino, San Diego, San Luis Obispo, Stanislaus, Ventura. *MÉXICO:* TAMAULIPAS: Victoria; 16 km S of Reynosa; SAN LUIS POTOSÍ: Guanajuato border on Hwy 57 (100°45′W, 23°19′N); NUEVO LEÓN: 41 km NE of China (98°54′W, 25°51′N); COAHUILA: 16 km E of Cuatro Cienega; San Pedro; ZACATECAS: 20 km N of Fresnillo (102°57′W, 23°19′N); 15 km NE Concepcion de Ora; CHIHUAHUA: Las Delicias; 21 km N of Ciudad Camargo (105°13′W, 27°52′N); 40 km W of Camargo; SONORA: 25 km S of Hermosillo; Sonoyta; 1.6 km W of San Carlos Bay; 10 km S of Presa, Obregon; BAJA CALIFORNIA NORTE: 11 km SE of Mexicali; Rancho Santa Cecelia nr. El Progresso; San Jose, Meling Ranch; San Felipe; 12 km S of Santo Tomás; BAJA CALIFORNIA SUR: Conception Bay; 3 km S of La Paz; 42 km S of Loreto; San Franciscito Bay; San José Island; DURANGO: Durango.

Natural History. Common on desert vegetation, including mesquite, tamarisk, *Acacia*, creosote bush, oaks, and *Chilopsis*. Elevations recorded from −70 to 1,000 m (5 records), 1,000 to 1,500 m (5 records), and 1,500 to 2,100 m (4 records), though these may not be representative because elevations are probably often not recorded for lowland localities. Where living on the same hillside with *mannii* in Arizona, there is a clear division in habitat: *M. chera* on mesquite and other typically desert shrubs and trees and *M. mannii* on oaks.

44. *Metaphidippus carmenensis* (Chamberlin, 1924) new combination

Figures 188, 189, 234, 529–533; Map 34

Dendryphantes carmenensis Chamberlin, 1924: 682, figs. 122, 123, ♂. Type in CAS 1♂ and (its right palpus in MCZ) with labels "Dendryphantes carmenensis Chamb., ♂ holotype, Carmen Id. 6/16/21. #177 J. C. Chamberlin " and "1461." Chamberlin reports the type locality as Salinas Bay, Carmen Island, Gulf of California. Roewer, 1954: 1192. Bonnet, 1956: 1392.

Dendryphantes imperialis:—Chamberlin, 1924, in part: 681 (Isla Angel de la Guarda and San José Island records).

Dendryphantes chera:—Chamberlin, 1924, in part: 683 (San Diego Island record).

Diagnosis. Much like *chera*, but with more curved embolus and left and right epigynal ducts failing to meet at midline at junction of second and third curves. Northern specimens are further distinct by their extensive covering of pale scales.

Male. Palpus (Figs. 234, 530): Erect portion of embolus thin, curving strongly toward the ventral. *Markings* (Figs. 188, 529): Very pale with dense covering of white and orange scales in northern males, though southern males darker. Carapace in northern males covered mostly with white except orange around eyes and in middle of thorax; in southern males marked more as in *chera*. Clypeus of northern ♂ densely covered with white scales except orange immediately under AMEs; southern males darker, only white setae are those overhanging chelicerae. Setae surrounding AMEs entirely orange in northern males; some white scales laterally in southern males. Chelicerae with patch of white scales, patch very broad in northern ♂. Cymbium beige to light brown dorsally and with white scales, darker brown on anterior lateral edge. Legs pale tan with dark brown annulae that are especially narrow in northern males. Abdomen orange above with wide white side bands in north; brown above with paired dark brown spots in south. *Measurements:* Body length 3.8(4.9)5.1 mm; carapace length 1.8(2.2)2.6 mm; width/length 0.80(0.82) 0.87; n = 5♂ from Baja California Sur, Baja California Norte, and California.

Female. Epigynum (Figs. 531, 532): Flaps weak and depigmented. Epigynal surface flat. Second curve of duct very short, so that ducts proceed posteriorly without meeting first at midline. *Markings* (Figs. 189, 533): Carapace covered with white scales. Clypeus covered densely with white scales. Legs uniformly yellow. Abdomen uniformly pale, with white scales, in northern females; with paired dark brown spots in southern females. *Measurements:* Body length 4.1(4.8)5.6 mm; carapace length 2.0(2.0)2.4 mm; width/length 0.79(0.79)0.83; n = 5♀ from Baja California Sur, Baja California Norte, and California.

Geographical Variation. Northern specimens (California; Baja California Norte; Sonora) are large and pale, especially ♂♂, whose faces are covered with white. Southern form (Baja California Sur) is smaller and darker, almost indistinguishable from *chera* except by genitalia.

Courtship (2♂ from Imperial Co., California). The five displays observed showed only an apparently low-intensity raised-spread stage. *Raisedspread* (n = 5, 2♂): First legs waved slowly and irregularly (n = 5, 2♂) up and down (n = 1); as he got closer legs moved more parallel until he reached to touch her (n = 1).

Distribution (Map 34). Baja California and Sonora extending north into California and Arizona.

Records. UNITED STATES: CALIFORNIA: Riverside Co.: Desert Beach (1♂, AMNH); Desert Beach Cmpgd (2♂ 5♀, MCZ); ARIZONA: Maricopa Co.: Wickenburg (1♀, AMNH). *MÉXICO:* BAJA CALIFORNIA NORTE: Isla Angel de la Guarda (3♂ 1♀); San Felipe (13♂ 22♀, AMNH); BAJA CALIFORNIA SUR: La Burrera, 19 air km ENE of Todos Santos (4♂ 3♀, UCB); Isla Carmen (1♂, CAS); south side Isla Partida (1♂ 3♀, AMNH); 3 km S of La Paz (1♂, UCB); San Diego Island (1♀, MCZ); San Jose Island (1♀, MCZ); 79 km S of Santa Rita (1♀, UCB); Todos Santos (1♂, AMNH); SONORA: Cholla Bay, 10 km N of Puerto Penasco (2♀, MCZ); La Choya (1♂ 3♀, AMNH); Desemboque (1♂ 2♀, AMNH); Hermosillo (2♀, AMNH).

Natural History. Collected with *M. chera* on tamarisk bordering the Salton Sea at Desert Beach, California, at −70 m elevation.

45. *Metaphidippus emmiltus* new species

Figures 176, 177, 235, 534–538; Map 36

Holotype male and paratype female in MCZ with label "NEW MEXICO: Guadalupe Co., along S[tate]

R[oad] 219, 6.0 mi [9.7 km] N of Pastura 5500 ft. el. [1,680 m], 22 Sept. 1983, D. Richman, WPM#83-173 on juniper."

Etymology. After the Greek *emmiltos,* referring to the reddish scales around the eyes.

Diagnosis. A beautiful species living on juniper, bearing superficial resemblance to the *pervaga* group of *Pelegrina.* The white-fringed legs, dense and distinct marginal and side bands on the carapace, and red-ringed anterior median eyes are distinctive. The female differs from that of *chera* in the failure of the second curves of the epigynal ducts to meet at the midline, the large fourth pair of white spots on the abdomen, and in New Mexican specimens the swollen carapace behind the anterior lateral eyes. The bend between the second and third curves is more distinct than in *carmenensis.*

Male. Palpus (Figs. 235, 535): Erect portion of embolus thin. *Carapace:* Bulges slightly at ALEs and narrowed behind ALEs in New Mexico males. *Markings* (Figs. 176, 534): Generally yellowish. Carapace with distinctive black stripe on forehead in New Mexico males, with V-shaped white forehead band in California males. Cheek band long and marginal, separated from side band by band of dark hairs. Clypeus orange-brown. Setae surrounding AMEs red; entirely red in New Mexico males, in California males red with some white scales laterally and where forehead band contacts AMEs dorsally 10:30–12:30. Chelicerae yellow-brown with orange scales except for small medial basal spot of white scales. Palpus pale yellowish, with dense patch of white scales on femur. Legs yellowish, with white fringe on first pair. Abdomen brown dorsally, paler centrally and with white side band and fourth pair of white spots prominent. *Measurements:* Body length 3.6, 3.7, 3.7, 3.8 mm; carapace length 1.8, 1.8, 1.9, 1.9 mm; width/length 0.79, 0.79, 0.80, 0.80; n = 4♂ from New Mexico.

Female. Epigynum (Figs. 536, 537): Flaps weak and depigmented. Epigynal surface flat. Second curve of left and right ducts do not meet at midline; bend between second and third curves abrupt; second and third curves narrow. *Markings* (Figs. 177, 538): Carapace covered with beige to tan scales. Clypeus densely covered with white scales. Legs more or less uniformly beige to light brown. Abdomen tan to light brown, dorsally darker and with paired white spots; fourth pair of spots unusually large. *Measurements:* Body length 4.2, 4.5, 4.8 mm; carapace length 1.9, 2.0, 2.1 mm; width/length 0.79, 0.81, 0.82; n = 3♀ from New Mexico.

Geographical Variation. Males from New Mexico and California differ in carapace shape and forehead markings, as already noted.

Distribution (Map 36). New Mexico west to southern California.

Records. UNITED STATES: NEW MEXICO: Guadalupe Co.: along SR 219, 9.7 km N of Pastura, 22 September 1983, on juniper (2♂ 1♀, MCZ); Lincoln Co.: T6N R6E S24, 21 June 1974, beating junipers (1♀, AMNH); T6N R10E S25, 24 May 1971 (1♂, AMNH); Sandoval Co.: northwest of Bernalillo (1♂, AMNH); Santa Fe Co.: 16 km S of Santa Fe (1♂ 1♀, AMNH); CALIFORNIA: Los Angeles Co.: 1.6 km W of Desert Springs, 1 June 1957, montane forest (1♂, AMNH); Palmdale, 5.6 km S of Hwy 6, 26 May 1957, juniper woodland, creosote bush scrub (1♂ 1♀, AMNH).

LITERATURE CITED

Abbot, J. 1792. Drawings of the Insects of Georgia, in America, Vol. 14, Spiders. Unpublished manuscript in the British Museum, London (copy seen).

Alayón, G. 1982. Redescripción de *Dolomedes fuscus* Franganillo (Arachnida: Araneae: Pisauridae). Poeyana, **250:** 1–7.

Banks, N. 1892. The spider fauna of the Upper Cayuga Lake Basin. Proceedings of the Academy of Natural Sciences, Philadelphia, **1892:** 11–81, 5 pls.

———. 1895. Some new Attidae. Canadian Entomologist, **27:** 96–102.

———. 1921. New Californian spiders. Proceedings of the California Academy of Sciences, 4th series, **11:** 99–102.

Barnes, R. D. 1955. North American jumping spiders of the genus *Maevia.* American Museum Novitates, **1746:** 1–13.

———. 1958. North American jumping spiders of the subfamily Marpissinae (Araneae, Salticidae). American Museum Novitates **1867:** 1–50.

Bauab-Vianna, M. J., and B. A. M. Soares. 1982.

Contribuição ao estudo dos Salticidae (Araneae) do Brasil. IX. Revista Brasileira de Entomologia, **26**(1): 87–91.

BHATNAGAR, R. D. S., AND J. G. REMPEL. 1962. The structure, function and postembryonic development of the male and female copulatory organs of the black widow spider *Latrodectus curacaviensis* (Müller). Canadian Journal of Zoology, **40:** 465–510.

BLEST, A. D. 1983. Ultrastructure of secondary retinae of primitive and advanced jumping spiders (Araneae, Salticidae). Zoomorphology, **102**(2): 125–141.

BLEST, A. D., AND C. SIGMUND. 1984. Retinal mosaics of the principal eyes of two primitive jumping spiders, *Yaginumanis* and *Lyssomanes*: clues to the evolutin of Salticid vision. Proceedings of the Royal Society of London B, **221:** 111–125.

BONNET, P. 1955–59. Bibliographia Araneorum, A-B (1955), C-F (1956), G-M (1957), N-S (1958), T-Z (1959). Analyse Methodique de toute la literature araneologique jusqu'en 1939. Toulouse, Paris.

BRIGNOLI, P. M. 1983. A catalogue of the Araneae described between 1940 and 1981. Manchester: Manchester Univ. Press. 755 pp.

BRYANT, E. B. 1940. Cuban spiders in the Museum of Comparative Zoology. Bulletin of the Museum of Comparative Zoology, **86:** 259–532.

———. 1941. Notes on the spider fauna of New England. Psyche, **48:** 129–146.

———. 1943. The salticid spiders of Hispaniola. Bulletin of the Museum of Comparative Zoology, **92:** 445–522.

———. 1950. The salticid spiders of Jamaica. Bulletin of the Museum of Comparative Zoology, **103:** 163–209.

CAMBRIDGE, F. O. P. 1901. Arachnida–Araneida, pp. 173–312. *In* F. D. Godman and O. Salvin (eds.), Biologia Centrali-Americana, Vol. 2. London.

CARPENTER, R. 1972. The jumping spiders (Salticidae) of Wichita County, Texas. The Southwestern Naturalist, **17**(2): 161–168.

CHAMBERLIN, R. V. 1924. The spider fauna of the shores and islands of the Gulf of California. Proceedings of the California Academy of Sciences, **12:** 678–694.

———. 1925a. Diagnoses of new American Arachnida. Bulletin of the Museum of Comparative Zoology, **67:** 211–248.

———. 1925b. New North American spiders. Proceedings of the California Academy of Sciences, (4) **14**(7): 105–142.

CHAMBERLIN, R. V., AND W. J. GERTSCH. 1929. New spiders from Utah and California. Journal of Entomology and Zoology, Pomona College, Claremont, **21:** 101–112.

———. 1930. On fifteen new North American spiders. Proceedings of the Biological Society of Washington, **43:** 137–144.

CHAMBERLIN, R. V., AND W. IVIE. 1941. Spiders collected by L. W. Saylor and others, mostly in California. Bulletin of the University of Utah, Biological Series, **31**(8): 1–49.

———. 1944. Spiders of the Georgia region of North America. Bulletin of the University of Utah, Biological Series, **35**(9): 1–267.

CHICKERING, A. M. 1944. The Salticidae (jumping spiders) of Michigan. Papers of the Michigan Academy of Sciences, Arts and Letters, **29:** 139–222.

———. 1946. The Salticidae (spiders) of Panama. Bulletin of the Museum of Comparative Zoology, **97:** 1–474.

CHICKERING, A. M., AND G. BACORN. 1933. Notes and studies on Arachnida. V. Additions to the list of Araneae from Michigan. Papers of the Michigan Academy of Sciences **17:** 521–528.

CRANE, J. 1949a. Comparative biology of Salticid spiders at Rancho Grande, Venezuela. Part III. Systematics and behavior in representative new species. Zoologica, **34**(2): 31–52.

———. 1949b. Comparative biology of Salticid spiders at Rancho Grande, Venezuela. Part IV. An analysis of display. Zoologica, **34**(4): 159–214.

CURTIS, J. L. 1892. A new jumping spider. Zoe, **3:** 332–337.

CUTLER, B. E. 1979. Variation in the embolus of *Metaphidippus insignis* (Banks) (Araneae: Salticidae). New York Entomological Society, **87:** 270–274.

———. 1981a. A revision of the spider genus *Paradamoetas* (Araneae, Salticidae). Bulletin of the American Museum of Natural History, **170:** 207–215.

———. 1981b. Key to late instar immatures of *Metaphidippus* and *Eris* (Salticidae) in Minnesota. Peckhamia, **2**(2): 31–32.

———. 1987. A revision of the American species of the antlike jumping spider genus *Synageles* (Araneae, Salticidae). Journal of Arachnology, **15**(3): 321–348.

CUTLER, B. E., AND D. T. JENNINGS. 1985. A revision of the *Metaphidippus arizonensis* group (Araneae, Salticidae). Journal of Arachnology, **13**(): 1–8.

DONDALE, C. D. 1961. Life histories of some common spiders from trees and shrubs in Nova Scotia. Canadian Journal of Zoology, **39:** 777–787.

EAKIN, R. M., AND J. L. BRANDENBURGER. 1971. Fine structure of the eyes of jumping spiders. Journal of Ultrastructure Research, **37:** 616–663.

EDWARDS, G. B. 1977. Comments on some genus and species problems in the Salticidae, including Walckenaerian names. Peckhamia, Gainesville, **1**(2): 21–23.

———. 1980. Jumping spiders of the United States and Canada: changes in the key and list (4). Peckhamia, Gainesville, **2**(1): 11–14.

EMERTON, J. H. 1891. New England spiders of the family Attidae. Transactions of the Connecticut Academy, **8:** 1–34.

FRANGANILLO BALBOA, P. 1930. Arácnidos de Cuba. Mas arácnidos nuevos de la Isla de Cuba. Memorias del Instituto Nacional de Investigaciones Cientificos, Havana, **1:** 47–99.

———. 1936. Los Arácnidos de Cuba hasta 1936. Havana: Cultural. 180 pp.

GALIANO, M. E. 1963. Las especies americanas de arañas de la familia *Salticidae*, descriptas por Eugène Simon. Redescripciones basadas en los ejemplares típicos. Physis (Buenos Aires), **23**(66): 273–470.

———. 1980. Catalogo de los especimenes tipicos de Salticidae (Araneae) descriptos por Candido F. de Mello-Leitão. Primera Parte. Physis (Buenos Aires), Secc. C, **39**(96): 31, 40.

GERTSCH, W. J. 1934. Further notes on American spiders. American Museum Novitates, **726:** 1–26.

———. 1935. Spiders from the southwestern United States, with descriptions of new species. American Museum Novitates, **792:** 1–31.

GERTSCH, W. J., AND W. IVIE. 1955. The spider genus *Neon* in North America. American Museum Novitates, **1743:** 1–17.

GERTSCH, W. J., AND S. E. RIECHERT. 1976. The spatial and temporal partitioning of a desert spider community, with descriptions of new species. American Museum Novitates, **2604:** 1–25.

GRISWOLD, C. E. 1987. A revision of the jumping spider genus *Habronattus* F.O.P.-Cambridge (Araneae; Salticidae), with phenetic and cladistic analyses. University of California Publications, Entomology, **107:** 1–344.

HENTZ, N. M. 1845. Descriptions and figures of the Araneides of the United States. Boston Journal of Natural History, **5:** 189–202.

———. 1846. Descriptions and figures of the Araneides of the United States. Boston Journal of Natural History, **5:** 352–370.

HILL, D. E. 1977a. The mating of *Phidippus princeps*. Peckhamia, **1**(1): 5–7.

———. 1977b. The pretarsus of salticid spiders. Zoological Journal of the Linnean Society, **60:** 319–338.

———. 1979. The scales of salticid spiders. Zoological Journal of the Linnean Society, **65:** 193–218.

HORNER, N. V. 1972. the bionomics of the spider *Metaphidippus galathea* (Walckenaer) and its significance as a biological control agent in sorghum. Dissertation Abstracts International (B), **33**(2): 766–767.

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1985. International Code of Zoological Nomenclature, 3rd ed., Adopted by the 20th General Assembly of the International Union of Biological Sciences. 338 pp.

JACKSON, R. R. 1978. An analysis of alternative mating tactics of the jumping spider *Phidippus johnsoni* (Araneae, Salticidae). Journal of Arachnology, **5:** 185–230.

JENNINGS, D. T. 1973. Egg retreat of *Metaphidippus arizonensis* (Peckham) (Araneae: Salticidae) in a hollow stem. Entomological News, **84:** 317–320.

JUNG, A. K. S., AND V. D. ROTH. 1974. Spiders of the Chiracahua Mountain Area, Cochise Co., Arizona. Journal of the Arizona Academy of Sciences, **9:** 29–34.

KASTON, B. J. 1945. New spiders in the group Dionycha with notes on other species. American Museum Novitates, **1290:** 1–25.

———. 1948. Spiders of Connecticut. Bulletin of the Connecticut State Geological and Natural History Survey, **70:** 1–874.

———. 1973. Four new species of *Metaphidippus*, with notes on related jumping spiders (Araneae: Salticidae) from the eastern and central United States. Transactions of the American Microscopical Society, **92:** 106–122.

KEYSERLING, E. G. 1884. Neue Spinnen aus Amerika. VI. Verhandlungen. Zoologisch-botanische Gesellshaft in Wien, **34:** 489–534.

KOCH, C. L. 1846. Die Arachniden. Dreizehnter Band. Nürnberg, pp. 1–234.

LAND, M. F. 1969a. Structure of the retinae of the principal eyes of jumping spiders (Salticidae: Dendryphantinae) in relation to visual optics. Journal of Experimental Biology, **51:** 443–470.

———. 1969b. Movements of the retinae of jumping spiders (Salticidae: Dendryphantinae) in response to visual stimuli. Journal of Experimental Biology, **51:** 471–493.

———. 1971. Orientation of jumping spiders in the absence of visual feedback. Journal of Experimental Biology, **54:** 119–139.

LEVI, H. W. 1985. The spiny orb-weaver genera *Micrathena* and *Chaetacis* (Araneae: Araneidae). Bulletin of the Museum of Comparative Zoology, **150:** 429–618.

LEVI, H. W., AND L. R. LEVI. 1951. Report on a collection of spiders and harvestmen from Wyoming and neighboring states. Zoologica (New York), **36:** 219–237.

MACHADO, A. DE BARROS. 1951. Ochyroceratidae (Araneae) de l'Angola. Publicaçoes culturais da Companhia de Diamantes de Angola, **8:** 9–87.

MADDISON, W. P. 1982. XXXY sex chromosomes in males of the jumping spider genus *Pellenes* (Araneae: Salticidae). Chromosoma (Berlin), **85:** 23–37.

———. 1987. *Marchena* and other jumping spiders with an apparent leg-carapace stridulatory mechanism (Araneae: Salticidae: Heliophaninae and Thiodininae). Bulletin of the British Arachnological Society, **7:** 101–106.

———. 1988. A revision of jumping spider species groups formerly placed in the genus *Metaphidippus*, with a discussion of salticid phylogeny (Araneae). Ph.D. thesis, Harvard University, Cambridge.

MADDISON, W. P., M. J. DONOGHUE, AND D. R. MAD-

DISON. 1984. Outgroup analysis and parsimony. Systematic Zoology, **33**(1): 83–103.

MADDISON, W. P., AND G. E. STRATTON. 1988. A common method of sound production by courting jumping spiders (Araneae: Salticidae). Journal of Arachnology, **16:** 267–270.

MUMA, M. H. 1944. A report on Maryland spiders. American Museum Novitates, **1257:** 1–14.

OSTERLOH, A. 1922. Beiträge zur Kenntnis des Kopulationsapparates einiger Spinnen. Zeitschrift für wissenschaftliche Zoologie, **119:** 326–421.

PECKHAM, G. W., AND E. G. PECKHAM. 1883. Descriptions of new or little known spiders of the family Attidae, from various parts of the United States of North America. Milwaukee, Wisconsin. 33 pp.

———. 1888. Attidae of North America. Transactions of the Wisconsin Academy of Sciences, Arts and Letters, **7:** 3–104.

———. 1889. Observations on sexual selection in spiders of the family Attidae. Occasional Papers of the Natural History Society of Wisconsin, **1**(1): 1–60.

———. 1890. Additional observations on sexual selection in spiders of the family Attidae, with some remarks on Mr. Wallace's theory of sexual ornamentation. Occasional Papers of the Natural History Society of Wisconsin, **1**(3): 117–151.

———. 1896. Spiders of the family Attidae from Central America and Mexico. Occasional Papers of the Natural History Society of Wisconsin, **3:** 1–101.

———. 1901a. On spiders of the family Attidae found in Jamaica. Proceedings of the Zoological Society of London, **1901:** 6–16.

———. 1901b. Spiders of the Phidippus group of the family Attidae. Transactions of the Wisconsin Academy of Sciences, Arts and Letters, **13:** 282–359.

———. 1909. Revision of the Attidae of North America. Transactions of the Wisconsin Academy of Sciences, Arts and Letters, **16:** 355–646.

PETRUNKEVITCH, A. 1911. A synonymic index-catalogue of spiders of North, Central and South America with all adjacent islands, Greenland, Bermuda, West Indies, Terra del Fuego, Galapagos, etc. Bulletin of the American Museum of Natural History, **29:** 1–791.

PRÓSZYŃSKI, J. 1968. Revision of the spider genus *Sitticus* Simon, 1901 (Araneida, Salticidae). I. The *terebratus* group. Annales Zoologici (Warsaw; Polska Akademia, Nauk, Instytut Zoologiczny), **25:** 391–407.

———. 1971a. Revision of the spider genus *Sitticus* Simon, 1901 (Araneida, Salticidae). II. *Sitticus saxicola* (C.L. Koch, 1848) and related forms. Annales Zoologici (Warsaw; Polska Akademia Nauk, Instytut Zoologiczny), **28:** 183–204.

———. 1971b. Redescriptions of A. E. Grube's east Siberian species of Salticidae (Aranei) in the collection of the Wroclaw Zoological Museum. Annales Zoologici (Warsaw; Polska Akademia Nauk, Instytut Zoologiczny), **28**(11): 205–226.

———. 1973a. Revision of the spider genus *Sitticus* Simon, 1901 (Aranei, Salticidae), III. *Sitticus penicillatus* (Simon, 1875) and related forms. Annales Zoologici (Warsaw; Polska Akademia Nauk, Instytut Zoologiczny), **30:** 71–95.

———. 1973b. Systematic studies on east palearctic Salticidae, II. Redescriptions of Japanese Salticidae of the Zoological Museum in Berlin. Annales Zoologici (Warsaw; Polska Akademia Nauk, Instytut Zoologiczny), **30**(5): 97–128.

———. 1976. Studium systematyczno-zoogeograficzne nad rodzina Salticidae (Aranei) Regionow Palearktycznego i Nearktycznego. Wyzsza Szkola Pedagogiczna w Siedlcach Rozprawy **6:** 1–260.

———. 1980. Revision of the spider genus *Sitticus* Simon, 1901 (Aranei, Salticidae), IV. *Sitticus floricola* (C. L. Koch) group. Annales Zoologici (Warsaw; Polska Akademia Nauk, Instytut Zoologiczny), **36:** 1–35.

———. 1982. Salticidae (Araneae) from Mongolia. Annalis Historico-naturales. Musei Nationales Hungerici, **74:** 273–294.

———. 1984. Atlas rysunkow diagnostycznych mnief znznych Salticidae [Diagnostic drawings of less known Salticidae (Araneae)—an atlas.] Siedlce: WSRP. 177 pp.

———. 1990. Catalogue of Salticidae (Araneae): synthesis of quotations in the world literature since 1940, with basic taxonomic data since 1758. Siedlce: WSRP. 366 pp.

RICHMAN, D. B. 1981. A revision of the genus *Habrocestum* (Araneae, Salticidae) in North America. Bulletin of the American Museum of Natural History, **170:** 197–206.

———. 1982. Notes on the courtship of southwestern *Metaphidippus* and *Pellenes* (Araneae: Salticidae). Peckhamia, **2**(3): 38–40.

———. 1989. A revision of the genus *Hentzia* (Araneae, Salticidae). Journal of Arachnology, **17:** 285–344, 155ff.

RICHMAN, D. B., AND B. E. CUTLER. 1978. A list of the jumping spiders (Araneae: Salticidae) of the United States and Canada. Peckhamia, **1**(5): 82–110.

RICHMAN, D. B., AND V. D. ROTH. 1976. A revised list of the jumping spiders (Araneae: Salticidae) of Yuma County, Arizona. Southwestern Naturalist, **21:** 199–202.

ROEWER, C. F. 1951. Neue Namen einiger Araneen-Arten. Abhandlungen. Naturwissenschaftlichen Verein zu Bremen, **32:** 437–456.

———. 1954. Katalog der Araneae von 1758 bis 1940, bsw. 1954. Institut Royal des Science Naturelles de Belgique, Bruxelles, **2b:** 927–1751.

SADANA, G. L. 1971. Method for expanding of the palpal organs of spiders. Science and Culture (Calcutta), **37:** 106–107.

SCHEFFER, T. H. 1905. Addition to the list of Kansas spiders. Industralist (Kansas), **31:** 435–444.

SCHENKEL, E. 1951. Spinnentiere aus dem westlichen Nordamerika, gesammelt von Dr. Hans Schenkel-Rudin. Verhandlungen der Naturforschenden Gesellschaft in Basel, Separatabdruck, **62:** 24–62.

SCHULT, J. 1980. Die Genitalstruckturen haplogyner Araneae unter phylogenetischem Aspekt (Arachnida). Dissertation, Biol., Univ. Hamburg.

SIMON, E. 1901. Histoire Naturelle des Araignées. Deuxième édition. Tome 2, fasc. 3. Paris, pp. 381–668.

———. 1903. Histoire Naturelle des Araignées. Deuxième édition. Tome 2, fasc. 4. Paris, pp. 669–1080.

STEINER, W. W. M., AND M. H. GREENSTONE. 1991. Segregation studies of isozyme variation in *Metaphidippus galathea* (Araneae, Salticidae). Journal of Arachnology, **19:** 157–160.

WALCKENAER, C. A. 1805. Tableau des Aranéides. Paris. 88 pp.

———. 1837. Histoire naturelle des Insectes. Aptères. Tome 1. Paris, pp. 1–682.

WANLESS, F. R. 1978. A revision of the spider genera *Belippo* and *Myrmarachne* (Araneae: Salticidae) in the Ethiopian region. Bulletin of the British Museum of Natural History (Zoology), **33:** 1–139.

———. 1984. A review of the spider subfamily Spartaeinae nom. n. (Araneae: Salticidae) with descriptions of six new genera. Bulletin of the British Museum of Natural History (Zoology), **46**(2): 135–205.

WHITEHEAD, W. F., AND J. G. REMPEL. 1959. A study of the musculature of the black widow spider, Latrodectus mactans (Fabr.). Canadian Journal of Zoology, **37:** 831–870.

WOODS, R. S. 1966. An English-Classical Dictionary for the Use of Taxonomists. Claremont, California: Pomona College.

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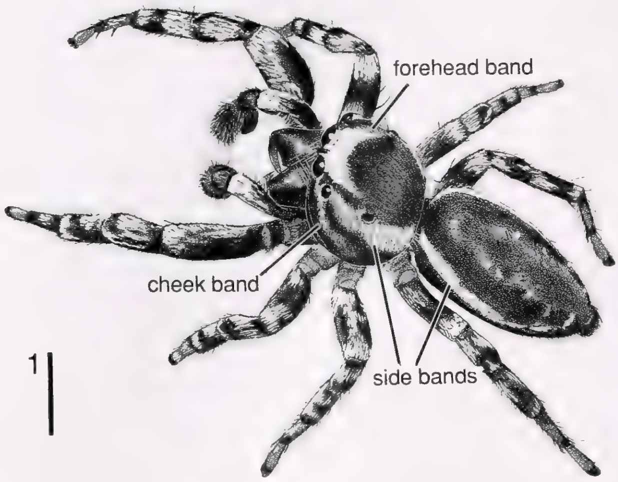
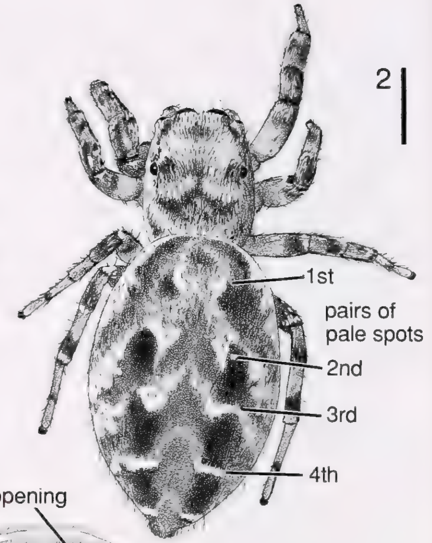
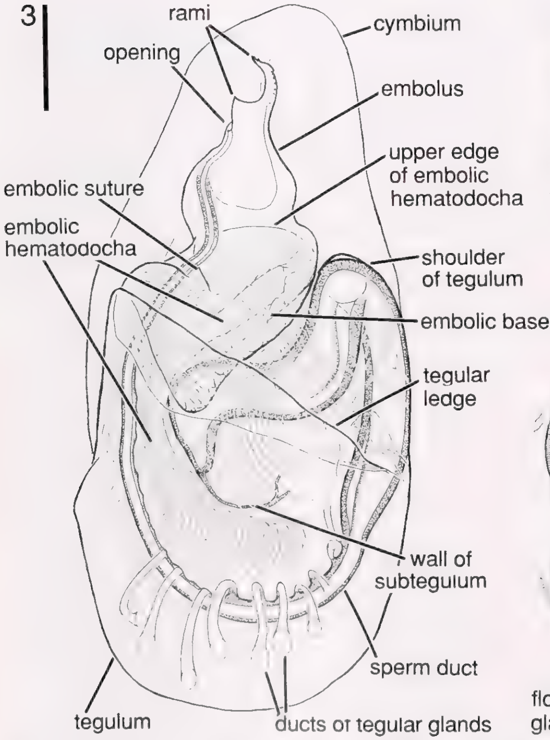
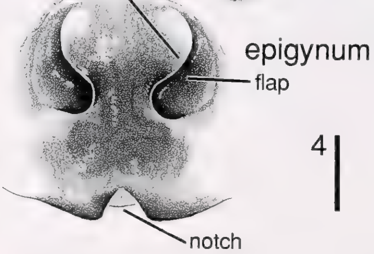

forehead band
cheek band
side bands
1


2
1st
pairs of pale spots
2nd
3rd
4th


3
rami
opening
cymbium
embolus
upper edge of embolic hematodocha
embolic suture
embolic hematodocha
shoulder of tegulum
embolic base
tegular ledge
wall of subtegulum
sperm duct
tegulum
ducts of tegular glands


opening
epigynum
flap
4
notch

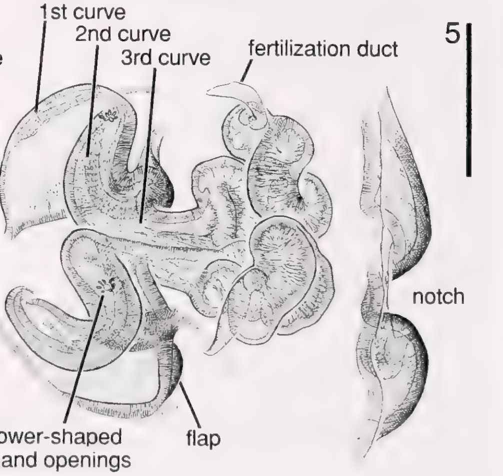

1st curve
2nd curve
3rd curve
fertilization duct
5
notch
flower-shaped gland openings
flap

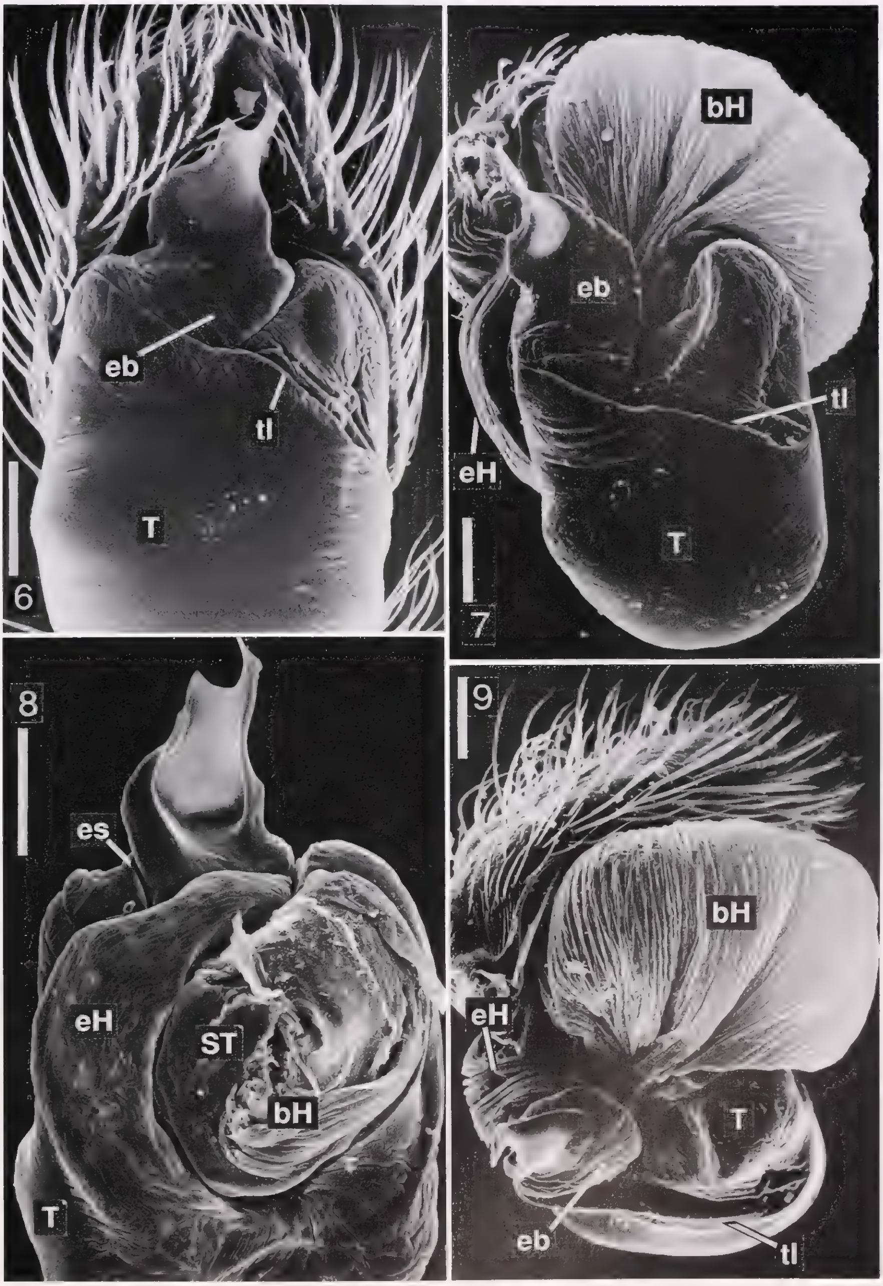
Figure 1. Adult male, *Pelegrina montana* (Montana: Jefferson Co.). Scale bar 1 mm.

Figure 2. Adult female, *Pelegrina proterva* (Pennsylvania: Adams Co.). Scale bar 1 mm.

Figure 3. Trypsin-cleared left palpus, ventral view, *Pelegrina proterva* (Massachusetts: Middlesex Co.). Scale bar 0.1 mm.

Figure 4. External view of epigynum, *Pelegrina edrilana* (Oaxaca: El Tule). Scale bar 0.1 mm.

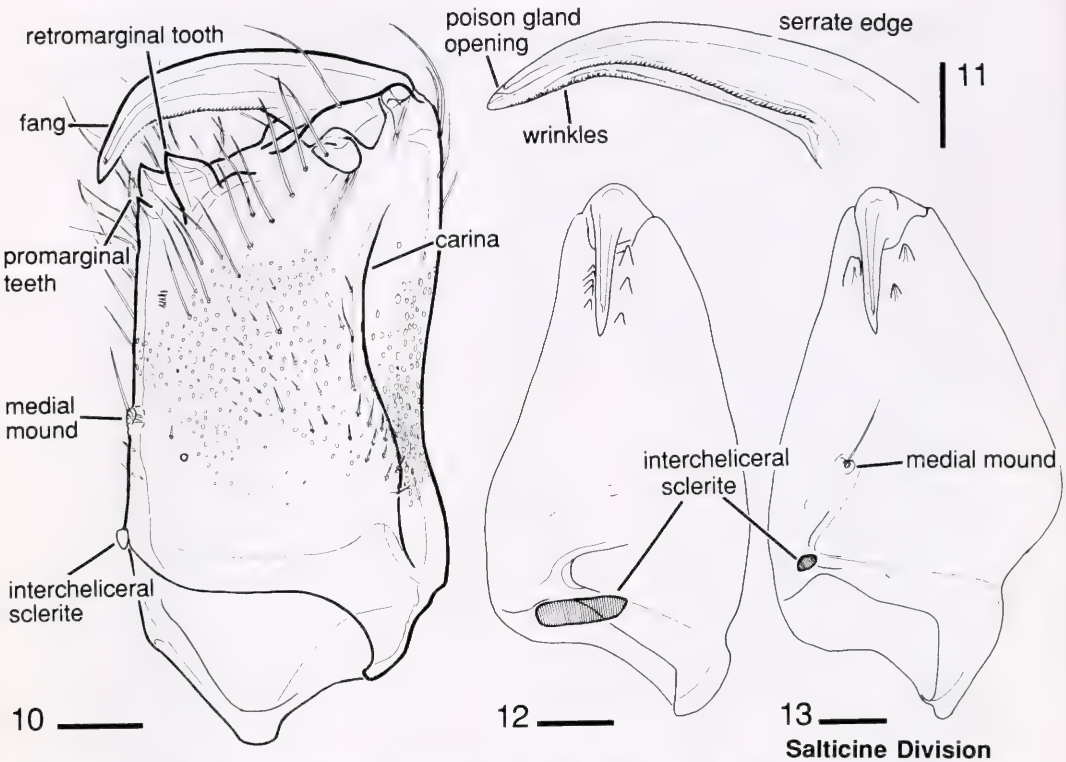
Figure 5. Trypsin-cleared epigynum, oblique internal view showing spermathecal ducts, *Pelegrina galathea* (Massachusetts: Middlesex Co.). Anterior is to left. Scale bar 0.1 mm.



Figures 6–9. Scanning electron micrographs of palpus of *Pelegrina proterva*. 6. Left palp, ventral view. 7. Left palp, expanded, ventral view. 8. Bulb of right palp, dissected from cymbium, dorsal view. 9. Left palp, expanded, apical view.

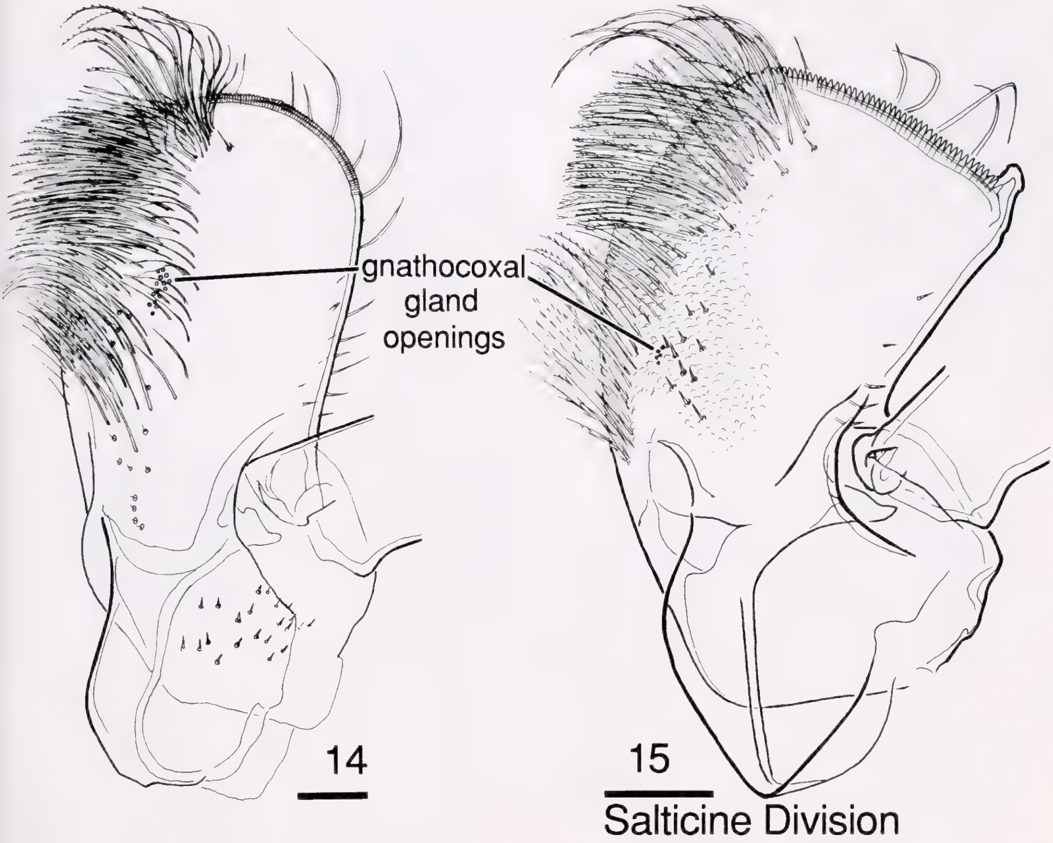
Abbreviations. bH, basal hematodocha; eb, embolic base; eH, embolic hematodocha; es, embolic suture; T, tegulum; tl, tegular ledge.

Scale bar. 0.1 mm.

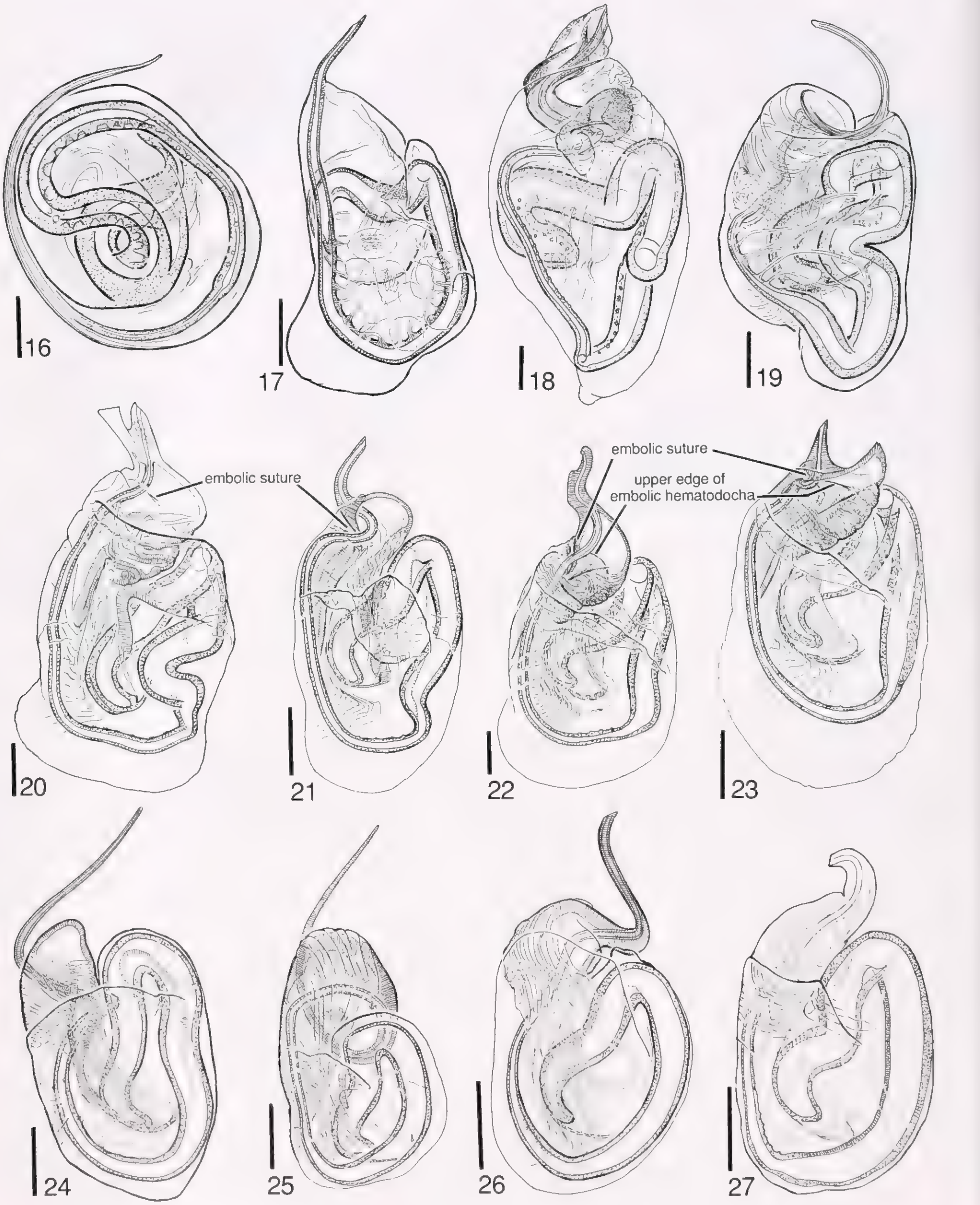

retromarginal tooth
fang
promarginal teeth
medial mound
intercheliceral sclerite
carina
10
poison gland opening
wrinkles
serrate edge
11
intercheliceral sclerite
medial mound
12
13
Salticine Division

Figures 10–15. Mouthparts of salticids. 10. Left chelicera of male, posterior view, *Pelegrina proterva* (Massachusetts). 11. Fang of left chelicera of male, oblique view from the posterior, *Pelegrina galathea* (North Carolina). 12. Right chelicera of male, medial view, *Cyrba algerina* (Yugoslavia). 13. Right chelicera of female, medial view, *Pelegrina galathea* (Massachusetts). 14. Right endite of male, dorsal view, *Lyssomanes viridis* (Texas). 15. Right endite of male, dorsal view, *Pelegrina proterva* (Massachusetts).

Scale bars. 0.1 mm.

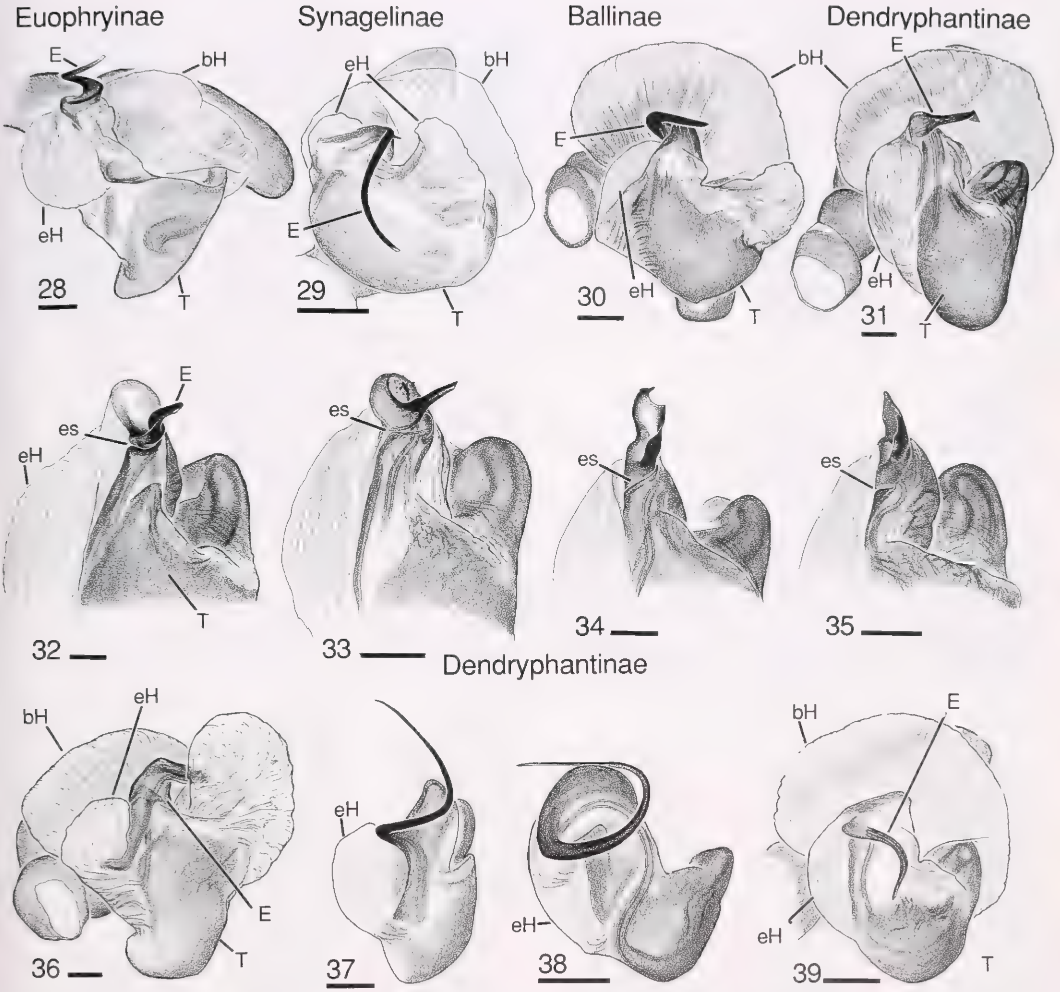

gnathocoxal
gland
openings
14
15
Salticine Division

Figures 10–15. Continued.


16
17
18
19
embolic suture
embolic suture
upper edge of
embolic hematodocha
20
21
22
23
24
25
26
27

Figures 16–27. Trypsin-cleared bulbs of left palpi of dendryphantes (Figs. 20–27) and other salticids (Figs. 16–19). 16. *Sitticus palustris* (British Columbia: nr. Fernie). 17. *Phintella* cf. *versicolor* (China: E. Kwantung). 18. *Phlegra fasciata* (Ontario: Long Point). 19. *Corythalia* sp. (Quintana Roo: 31 km NE of Felipe Carrillo Puerto). 20. *Phanias albeolus* (California: Monterey Co.). 21. *Anicius* sp. (Nuevo León: Chipinque Mesa). 22. *Terralonus mylothrus* (Colorado: Gunnison Co.). 23. *Metaphidippus mannii* (California: Riverside Co.). 24. *Hentzia palmarum* (Florida: Collier Co.). 25. *Zygoballus rufipes* (Tamaulipas: 99.1°W, 23.0°N). 26. *Zygoballus incertus* (Panamá: El Valle). 27. *Metaphidippus vitis* (Alberta: Taber).

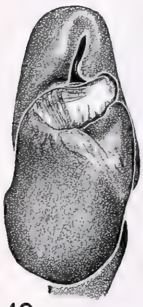
Scale bars. 0.1 mm.


Euophryinae
Synagelinae
Ballinae
Dendryphantinae
E
bH
eH
28
T
eH
bH
E
29
T
bH
E
eH
30
T
bH
E
eH
31
T
E
es
eH
T
32
es
33
es
34
es
35
Dendryphantinae
bH
eH
E
T
36
eH
37
eH
38
bH
E
eH
39
T

Figures 28–39. Expanded palpi of dendryphantes (Figs. 31–39) and other salticids (Figs. 28–30). 28. *Corythalia* sp. (Chiapas: Palenque). 29. *Synageles noxiosus* (Florida: Alachua Co.). 30. *Admestina tibialis* (New Hampshire: Concord). 31. *Eris flava* (G. & E. Peckham) (Nebraska: Morrill Co.). 32. *Phidippus insignarius* C. L. Koch (Colorado: Logan Co.). 33. *Metaphidippus chera* (Nevada: Chruchill Co.). 34. *Pelegrina proterva* (Massachusetts: Middlesex Co.). 35. *Pelegrina galathea* (Colorado: Bent Co.). 36. *Phanias* sp. (Chiapas: San Cristóbal). 37. *Hentzia palmarum* (Florida: Monroe Co.). 38. *Zygoballus rufipes* (Veracruz: Los Tuxtlas). 39. Species near *Zygoballus incertus* (Quintana Roo: Kohunlich ruins).

Abbreviations. bH, basal hematodocha; E, embolus; eb, embolic base; eH, embolic hematodocha; es, embolic suture; T, tegulum.

Scale bars. 0.1 mm.



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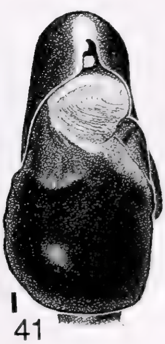

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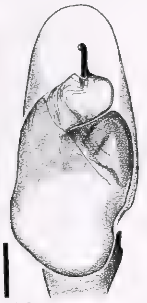

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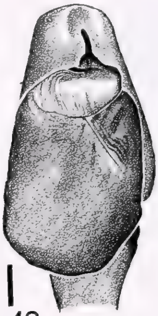

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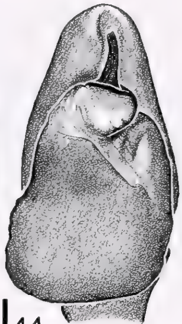

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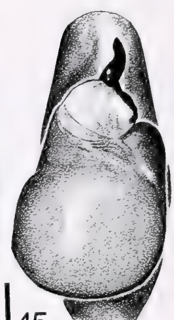

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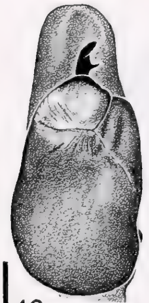

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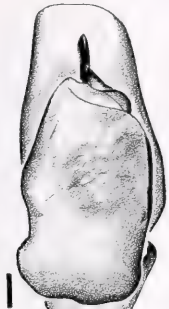

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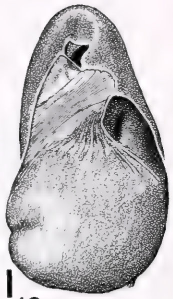

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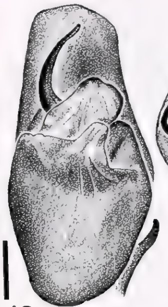

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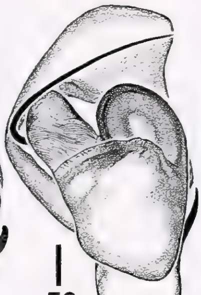

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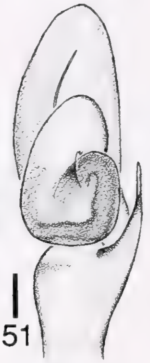

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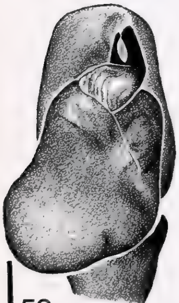

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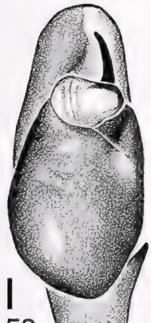

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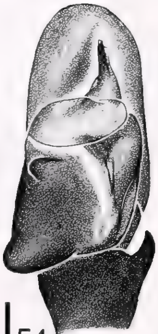

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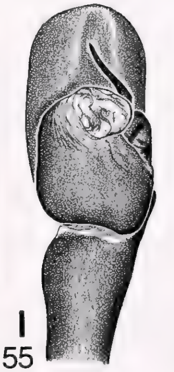

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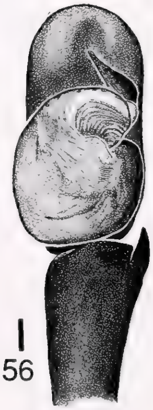

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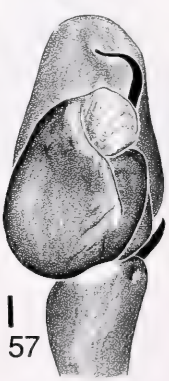

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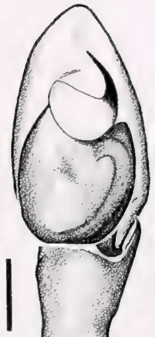

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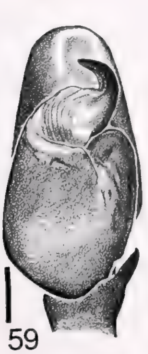

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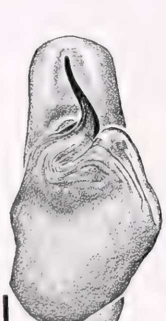

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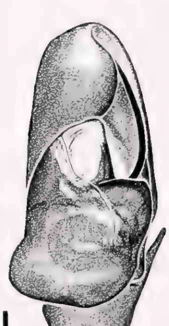

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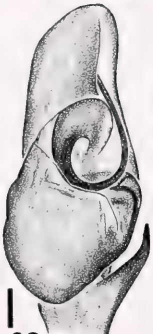

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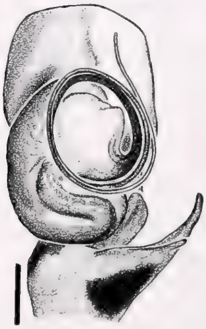

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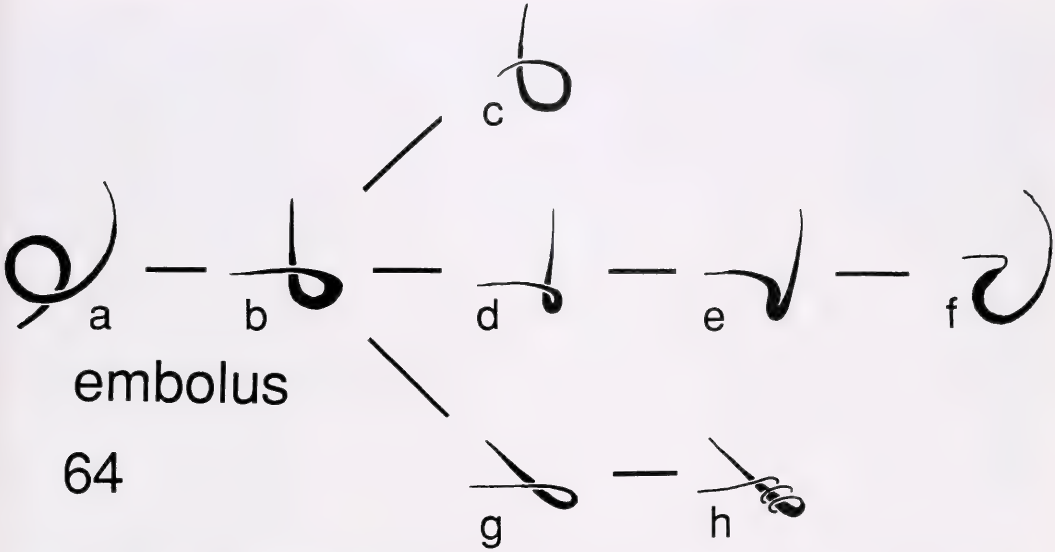
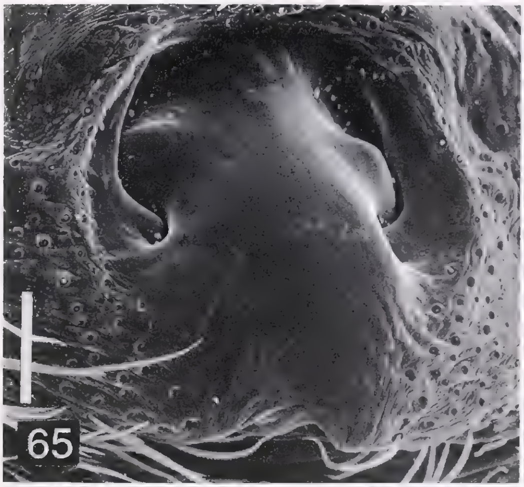


Figure 64. Hypothetical transformations among embolus types from the euophryine type (a) to the dendryphantine types (b–h). At the left or lower left of each of a–h is the base of the embolus; the tip of the embolus is at the top of each figure. Examples with these types are *Metaphidippus chera, Eris aurantia,* and *Bellota wheeleri* (b); *Hentzia* and *Zygoballus* (c); *Eris militaris* (d); *Paradamoetas* (e); *Dendryphantes tropicus* and *Mabellina* (f); *Metaphidippus mandibulatus* (g); and *Messua, Bagheera,* and *Gastromicans* (h).

←

Figures 40–63. Left palpi of various salticids of the subfamily Dendryphantinae. 40. *Eris* cf. *aurantia* (Chiapas: San Cristóbal). 41. *Phidippus audax* (Ontario: Burlington). 42. *Bellota wheeleri* (Oaxaca: SW of Valle Nacional). 43. "*Pseudicius*" *siticulosus* (Arizona: Yavapai Co.). 44. *Terralonus californicus* (California: Santa Cruz Co.). 45. *Sassacus papenhoei* (Nevada: Lander Co.). 46. *Tulpius hilarus* (Quintana Roo: Kohunlich ruins). 47. *Phanias harfordii* (California: San Mateo Co.). 48. *Ghelna castanea* (Virginia: Falls Church). 49. *Anicius dolius* Chamberlin (holotype; Jalisco: Guadalajara). 50. *Hentzia mitrata* (Hentz) (Minnesota: Washington Co.). 51. *Zygoballus rufipes* (Ontario: Essex Co.). 52. *Rhene* cf. *flavigera* (China: E. Kwantung: Yim Na San). 53. *Eris militaris* (Ontario: Port Elgin). 54. *Rudra geniculata* (Panamá: Canal Zone). 55. *Parnaenus recurvus* (paratype; Panamá: Barro Colorado Island). 56. "*Paraphidippus*" *validus* (paratype; Panamá: Barro Colorado Island). 57. Species near *Zygoballus incertus* (Quintana Roo: Kohunlich ruins). 58. *Paradamoetas fontana* (Ontario: Hastings Co.). 59. *Metaphidippus* cf. *vitis* (Puebla: nr. Xicotepec de Juarez). 60. *Dendryphantes perfectus* G. & E. Peckham (holotype; Brazil: Para). 61. "*Eris*" *nidicolens* (France: Marseille). 62. *Dendryphantes tropicus* G. & E. Peckham (holotype; Brazil: Chapoda). 63. *Mabellina prescotti* Chickering (paratype; Panamá: El Valle).

Scale bars. 0.1 mm.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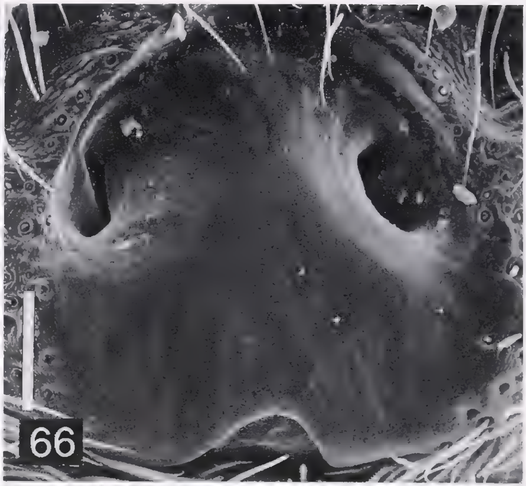
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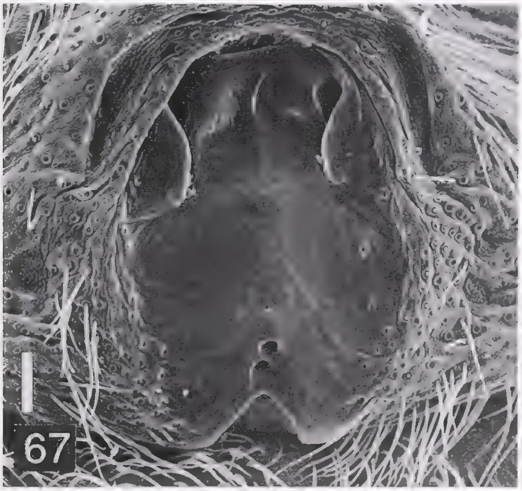
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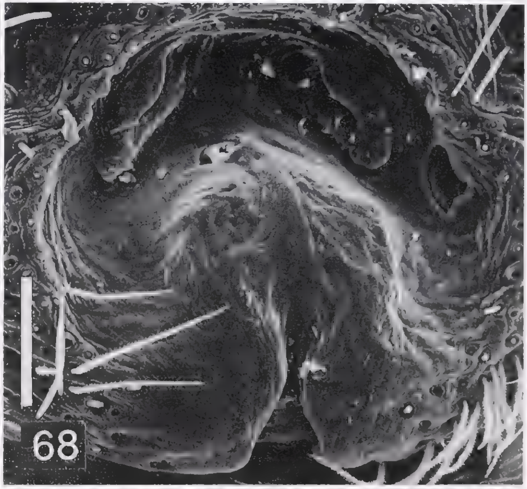
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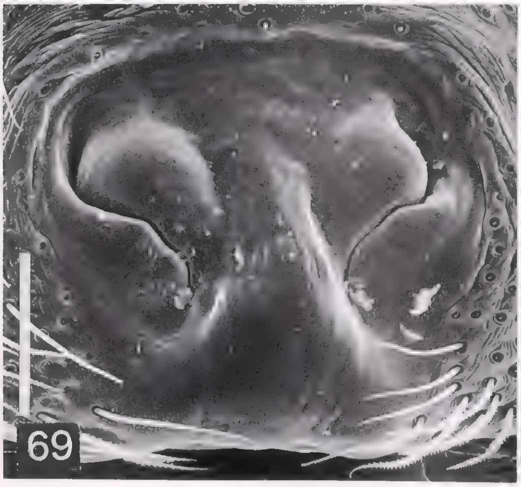
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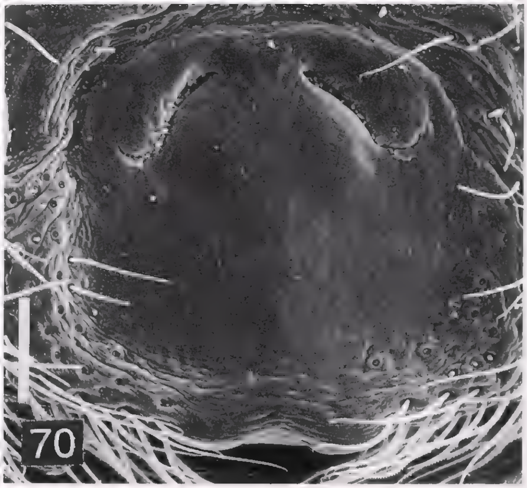
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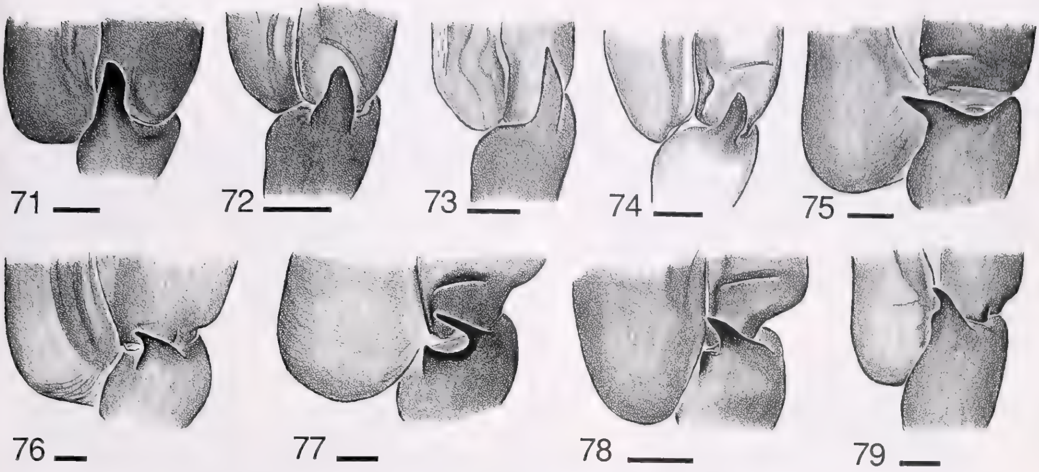

Figures 71–79. Tibial apophyses of left palpi of dendryphantines. 71. *Bagheera kiplingi* (Oaxaca: nr. Tuxtepec). 72. *Messua desidiosa* (Costa Rica: San Jose). 73. *Gastromicans levispina* (Panamá: El Valle). 74. *Metaphidippus mandibulatus* (holotype; Costa Rica). 75. *Phidippus audax* (Ontario: Halton Co.). 76. *Dendryphantes hastatus* (Poland: Smogorzew). 77. *Beata hispida* (Quintana Roo: Kohunlich ruins). 78. *Pelegrina galathea* (Texas: Bexar Co.). 79. *Eris militaris* (North Carolina).

Scale bars. 0.1 mm.

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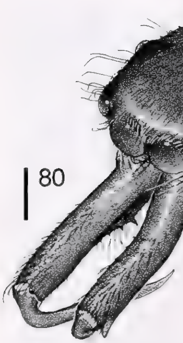
Figures 65–70. Scanning electron micrographs of epigyna of dendryphantines, showing teardrop-shaped flaps over openings. View is mostly ventral, slightly oblique lateral. 65. *Dendryphantes rudis* (U.S.S.R.: Buzjatia). 66. *Eris militaris* (Michigan: Emmet Co.). 67. *Phidippus audax* (Minnesota: Rochester). 68. *Terralonus mylothrus* (Colorado: Pitkin Co.). 69. *Sassacus papenhoei* (California: Santa Barbara Co.). 70. *Phanias albeolus* (Oregon: Lane Co.).

Scale bars. 0.1 mm.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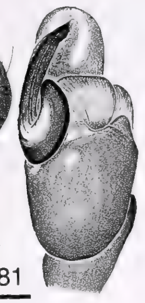
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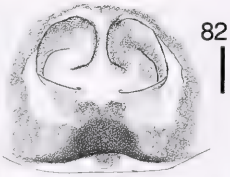
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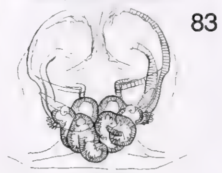
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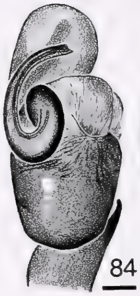
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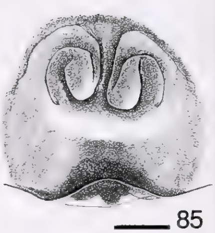
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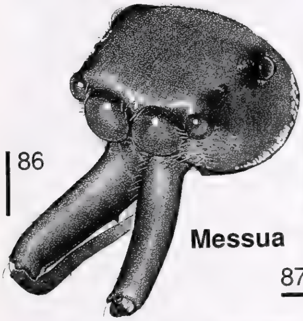
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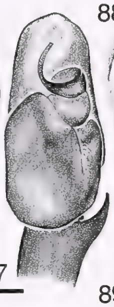
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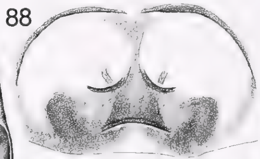
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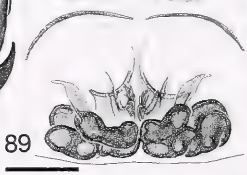
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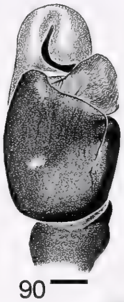
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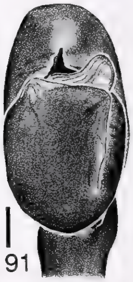
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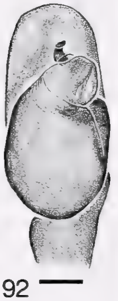
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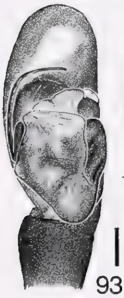
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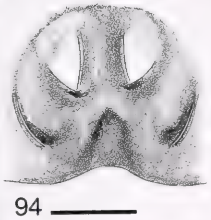
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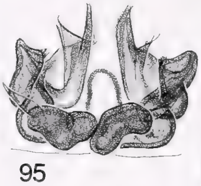
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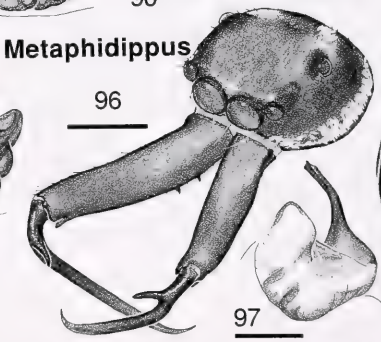
Gastromicans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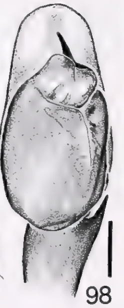
Metaphidippus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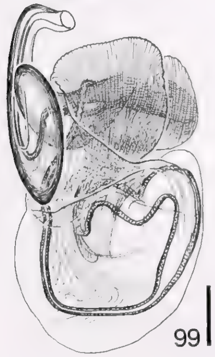
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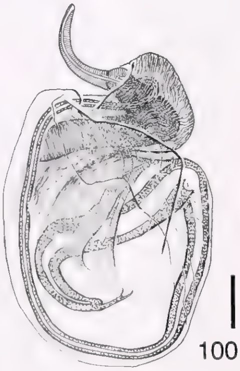
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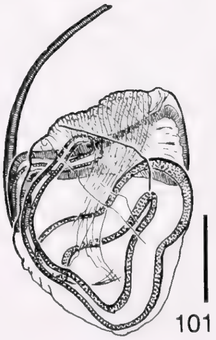
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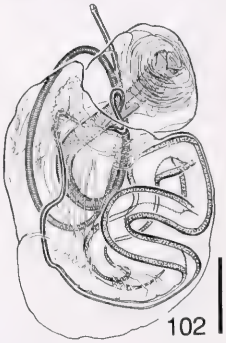
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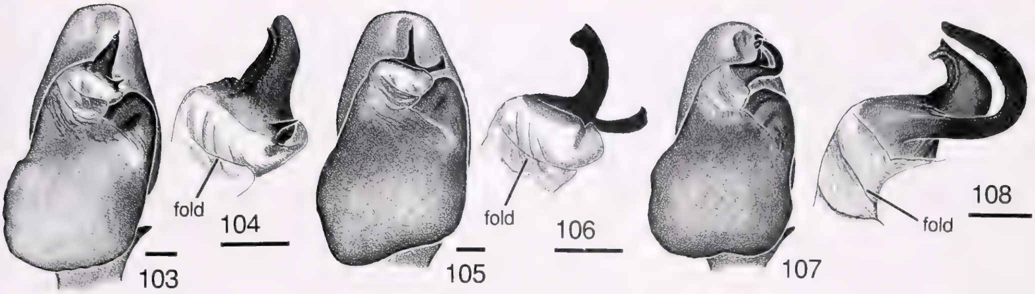

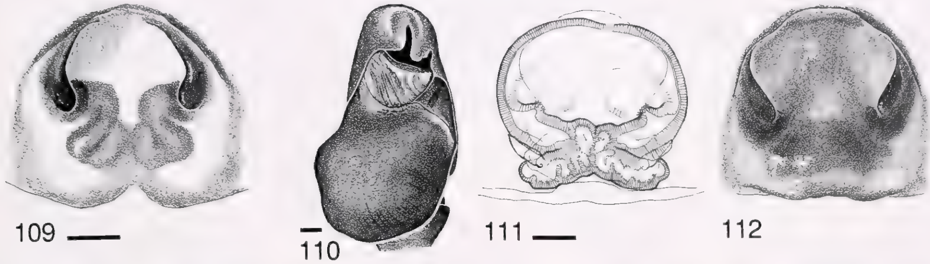

Figures 103–108. *Dendryphantes* species, left palpi (Figs. 103, 105, 107) and emboli, oblique ventral-retrolateral view (Figs. 104, 106, 108). 103, 104. *Dendryphantes hastatus* (Poland: Smogorzew). 105, 106. *Dendryphantes rudis* (105, France; 106, Spain: Barcelona: Baga). 107, 108. *Dendryphantes nigromaculatus* (107, Colorado: Chaffee Co.; 108, Colorado: Gunnison Co.).

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Scale bars. 0.1 mm.

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Figures 80–85. *Bagheera*. 80–83. *Bagheera kiplingi* (Oaxaca: nr. Tuxtepec): 80. Male face. 81. Left palpus; epigynum. 82. Ventral views. 83. Dorsal view. 84, 85. *Bagheera prosper* (Oaxaca: Valle Nacional). 84. Left palpus. 85. Epigynum, ventral view.

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Figures 93–95. *Gastromicans levispina* (Panamá: El Valle). 93. Left palpus; epigynum. 94. Ventral view. 95. Dorsal view.

Figures 96–98. *Metaphidippus mandibulatus* (holotype; Costa Rica). 96. Male face. 97. Oblique ventral-retrolateral view of left embolus. 98. Left palpus.

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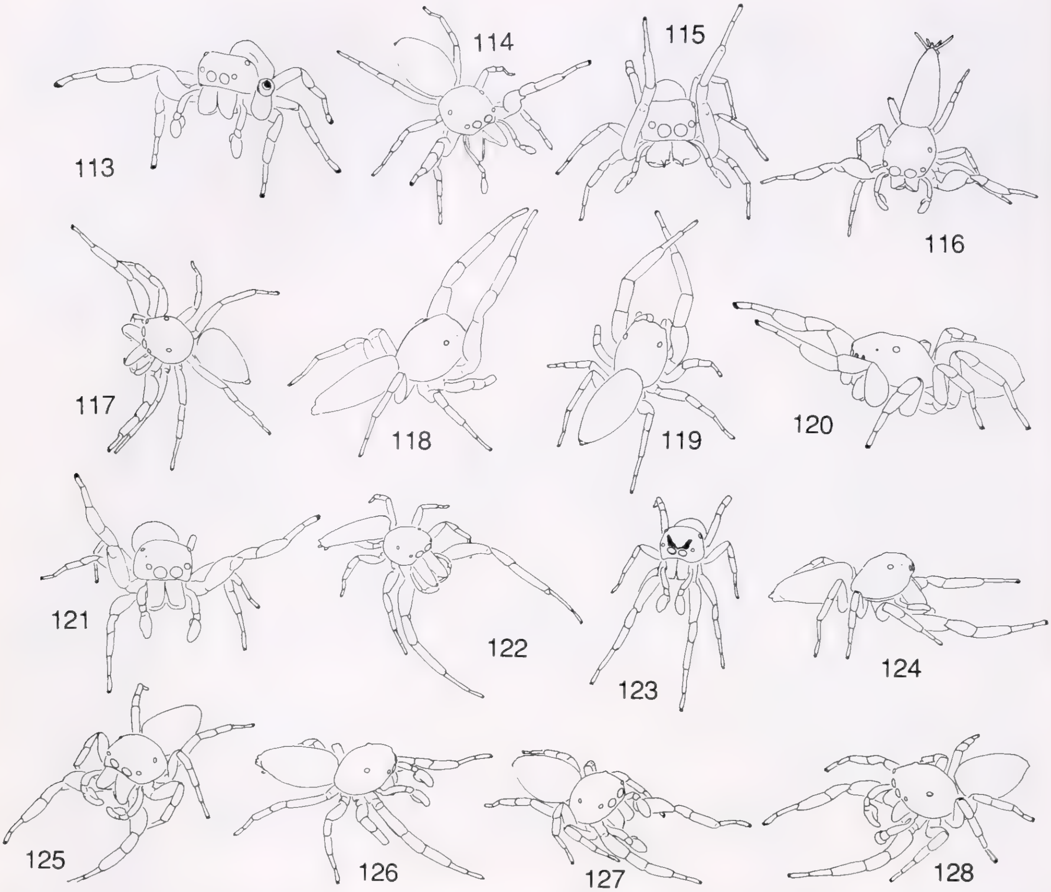
Scale bars. 0.1 mm, except for male faces 0.5 mm.



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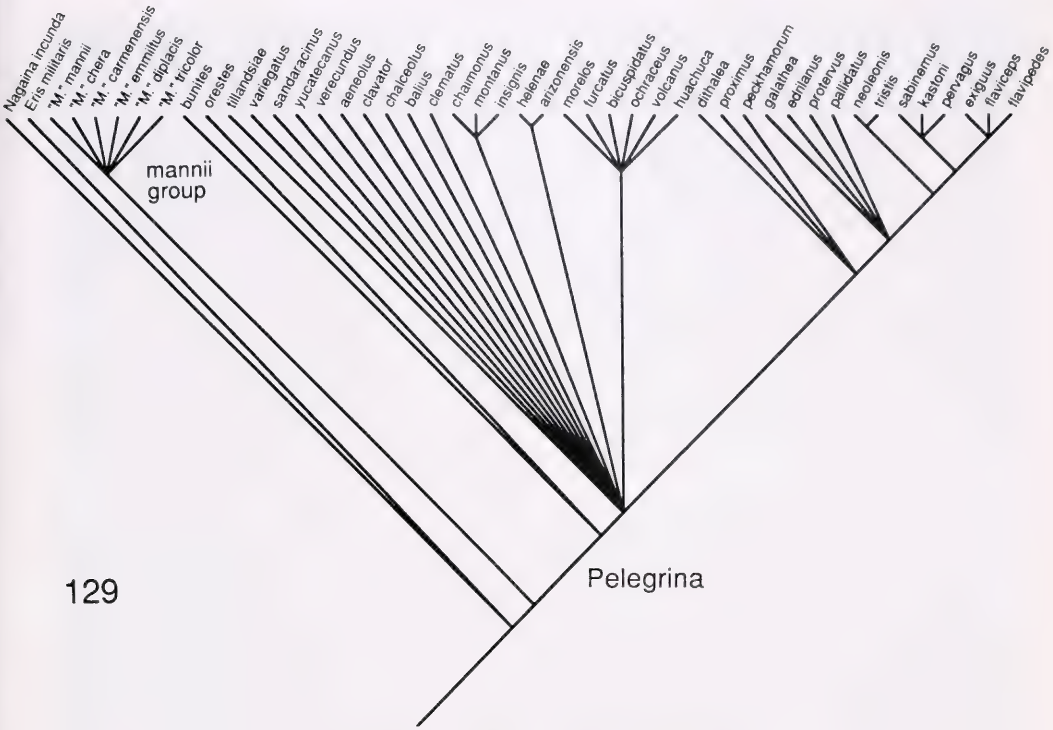
Nagaina incunda
Eris militaris
"M." mannii
"M." chera
"M." carmenensis
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"M." diplacis
"M." tricolor
bunites
orestes
tillandsiae
variegatus
sandaracinus
yucatecanus
verecundus
aeneolus
clavator
chalceolus
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chaimonus
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insignis
helenae
arizonensis
morelos
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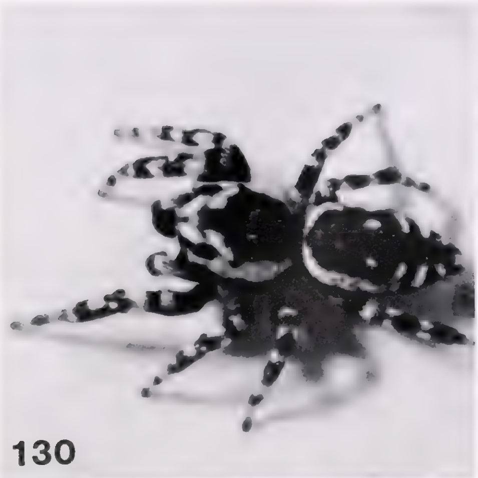
bicuspidatus
ochraceus
volcanus
huachuca
dithalea
proximus
peckhamorum
galathea
edrilanus
protervus
pallidatus
neoleonis
tristis
sabinemus
kastoni
pervagus
exiguus
flaviceps
flavipedes
mannii group
Pelegrina

Figure 129. Cladogram for *Pelegrina* species.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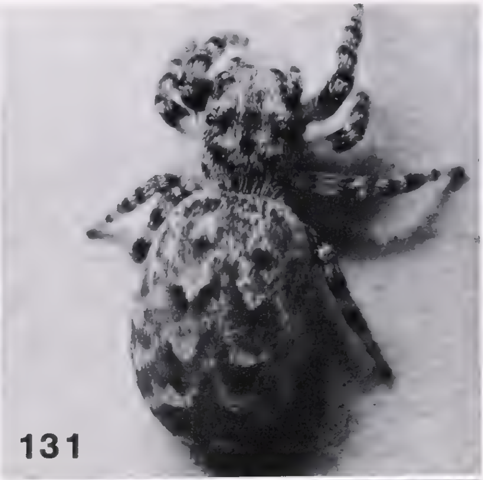
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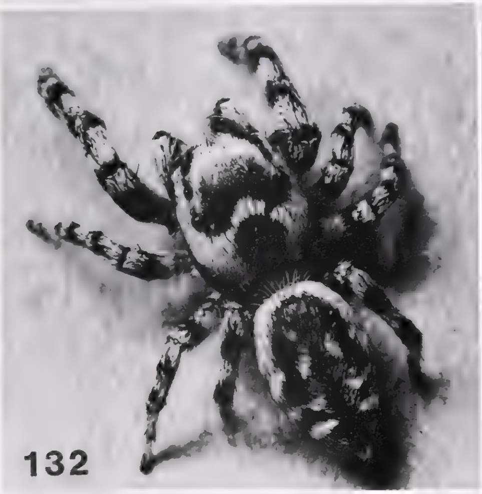
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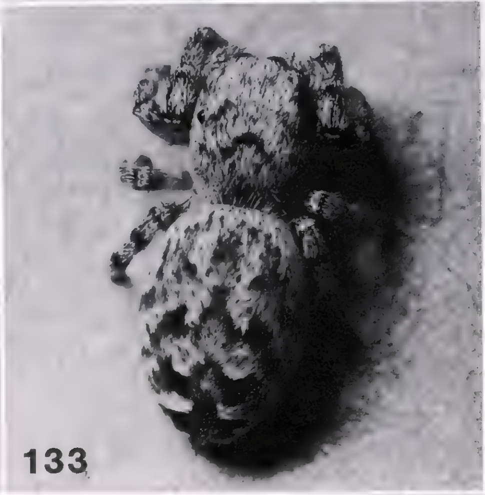
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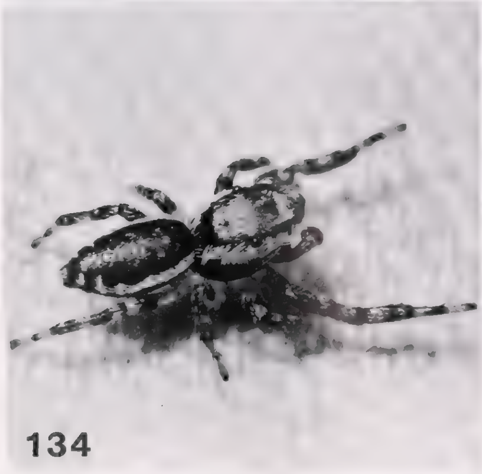
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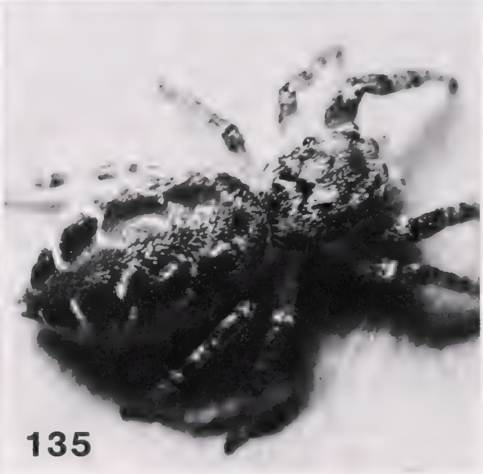
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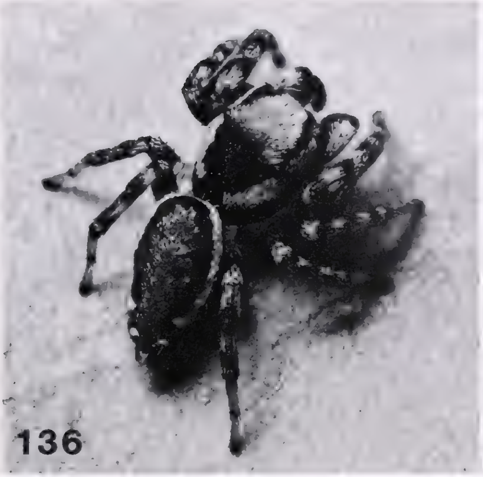
Figures 130–135. Photographs of living *Pelegrina*. 130, 131. *Pelegrina galathea* (sp. 1). 130. Male (Ontario: Mississauga). 131. Female (Massachusetts: Middlesex Co.). 132, 133. *Pelegrina dithalea* (sp. 3). 132. Male (holotype; Arizona: Sycamore Canyon). 133. Female (Arizona: Kitt Peak). 134, 135. *Pelegrina proterva* (sp. 5). 134. Male (Manitoba: Binscarth). 135. Female (Ontario: Sudbury District).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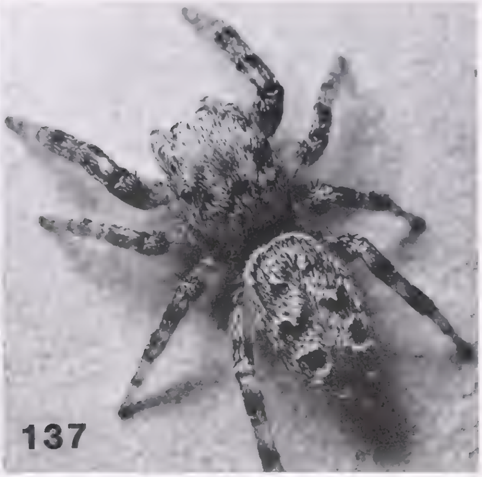
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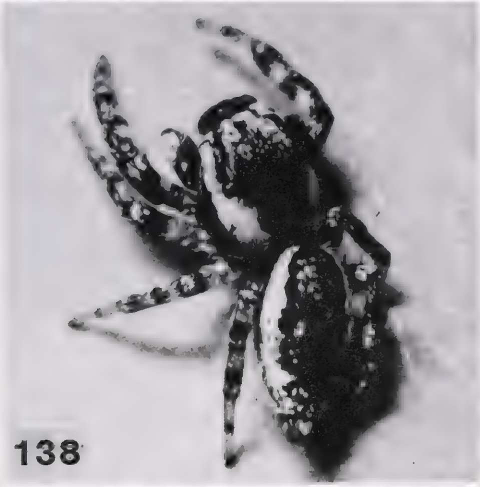
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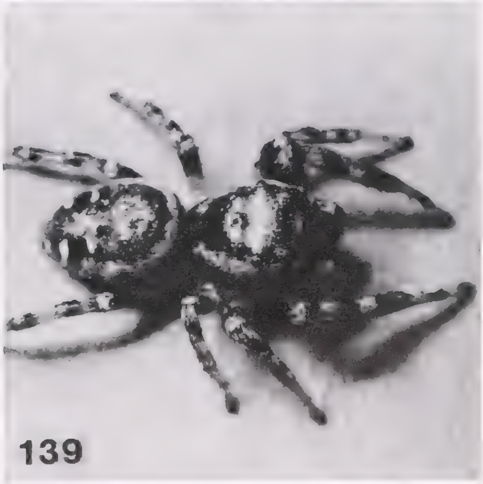
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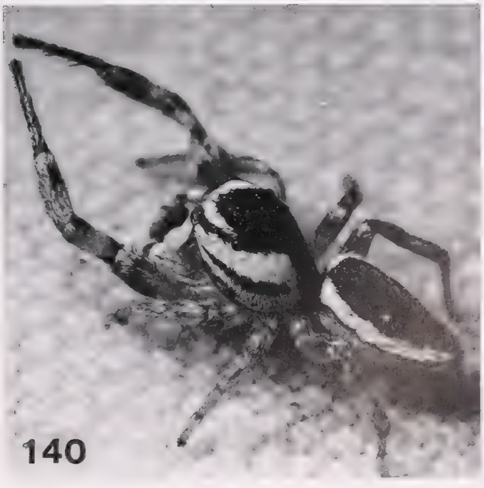
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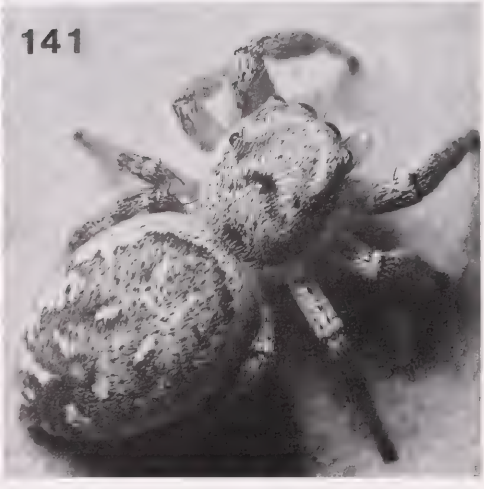
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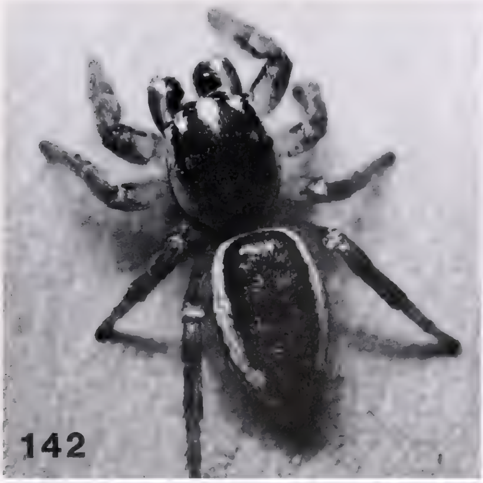
Figures 136–141. Photographs of living *Pelegrina*. 136, 137. *Pelegrina peckhamorum* (sp. 6); Massachusetts. 136. Male. 137. Female. 138. *Pelegrina neoleonis* (sp. 7): male (Nuevo León: Cerro Potosí). 139. *Pelegrina chalceola* (sp. 21): male (holotype: Arizona: Madera Canyon). 140, 141. *Pelegrina kastoni* (sp. 11). 140. Male (holotype; Arizona: Mount Hopkins). 141. Female (Arizona: Madera Canyon).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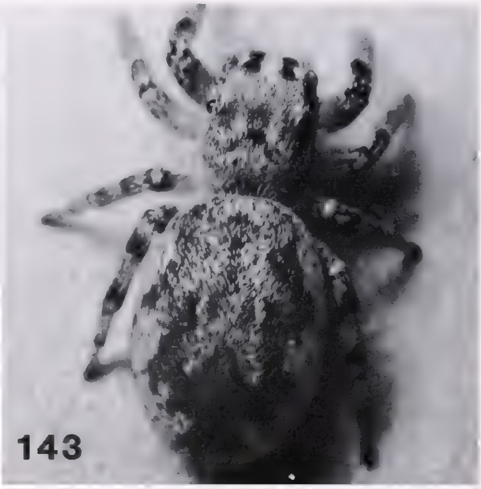
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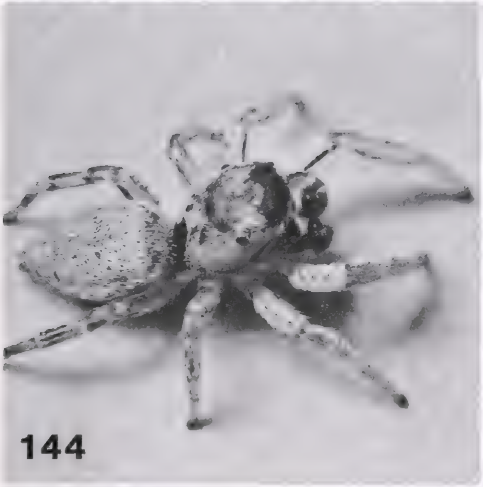
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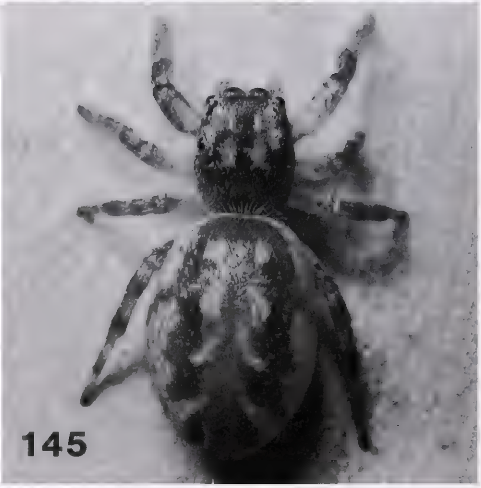
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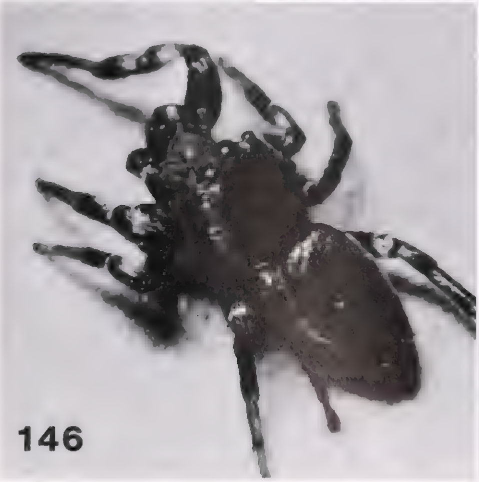
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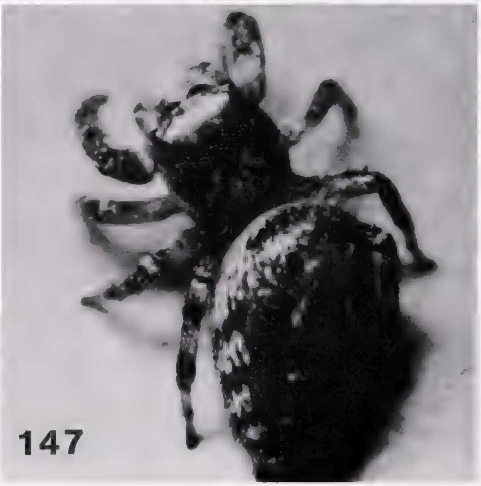
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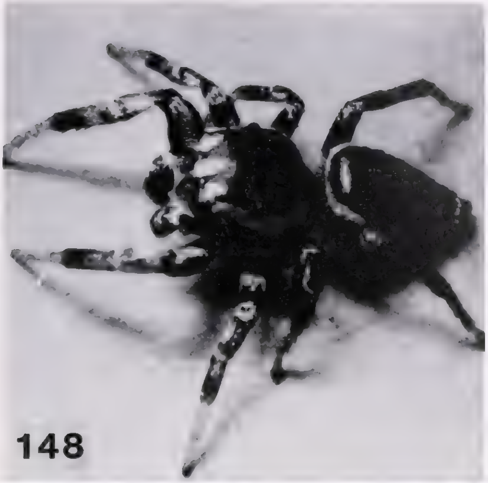
Figures 142–147. Photographs of living *Pelegrina*. 142, 143. *Pelegrina flavipedes* (sp. 12); Manitoba: nr. Neepawa). 142. Male. 143. Female. 144, 145. *Pelegrina flaviceps* (sp. 13). 144. Male (Maine: Sagadahoc Co.). 145. Female (New Hampshire: Durham). 146, 147. *Pelegrina exigua* (sp. 14) (dull form). 146. Male (Maryland: Montgomery Co.). 147. Female (Virginia: Shenandoah Co.).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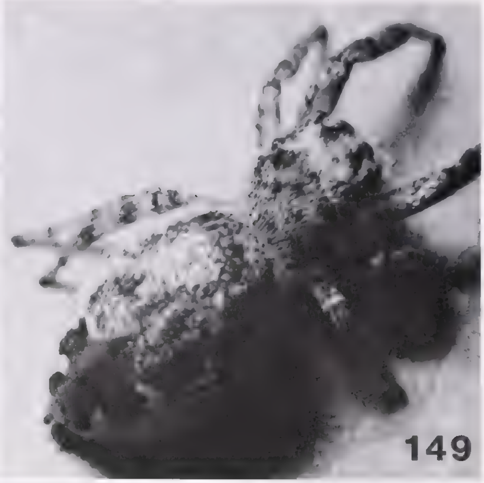
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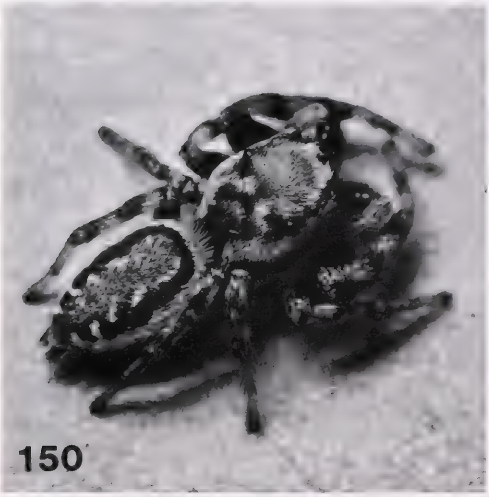
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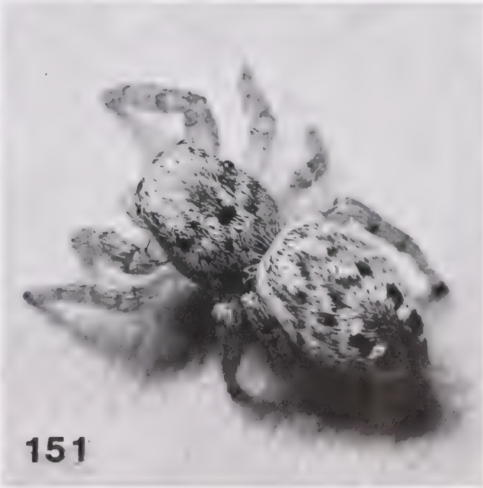
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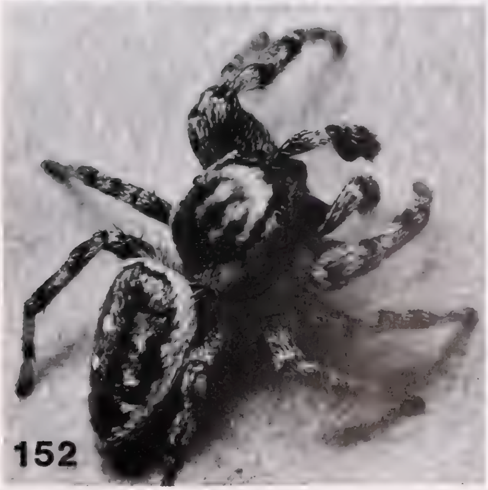
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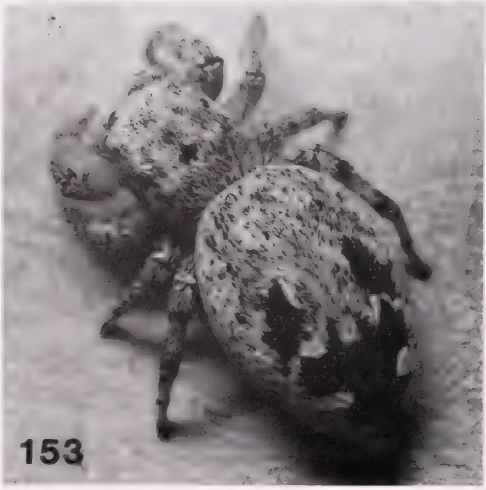
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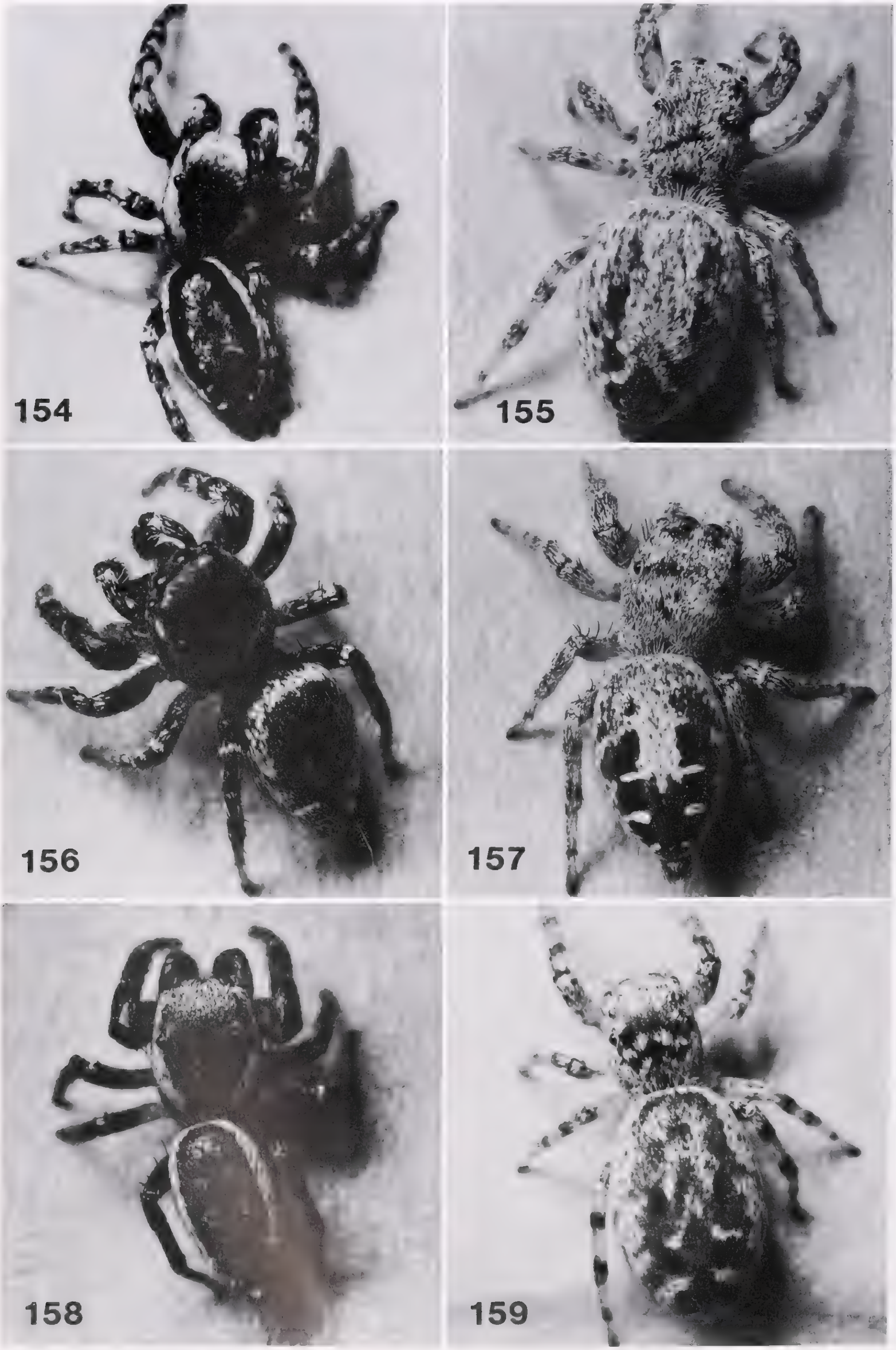
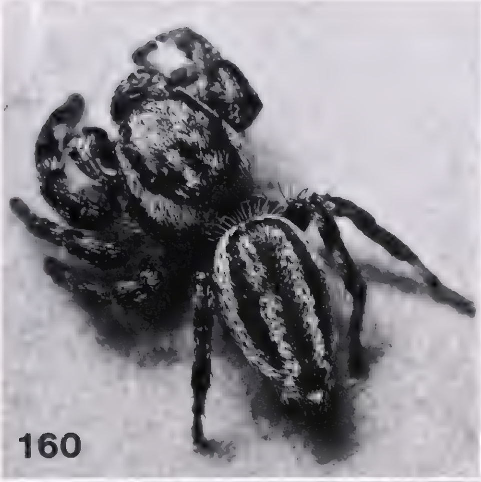
Figures 148–153. Photographs of living *Pelegrina*. 148, 149. *Pelegrina exigua* (sp. 14) (striped form). 148. Male (Maryland: Montgomery Co.). 149. Female (Virginia: Washington Co.). 150, 151. *Pelegrina insignis* (sp. 16; Minnesota: Hennepin). 150. Male. 151. Female. 152, 153. *Pelegrina clemata* (sp. 18; Saskatchewan: Outlook). 152. Male. 153. Female.



Figures 154–159. Photographs of living *Pelegrina*. 154. *Pelegrina montana* (sp. 15): male (Montana: Jefferson Co.). 155. *Pelegrina helenae* (sp. 29): female (Washington: Franklin Co.). 156, 157. *Pelegrina aeneola* (sp. 19; California: Riverside Co.). 156. Male. 157. Female. 158, 159. *Pelegrina furcata* (sp. 22). 158. Male (Arizona: Mount Hopkins). 159. Female (Arizona: Yavapai Co.).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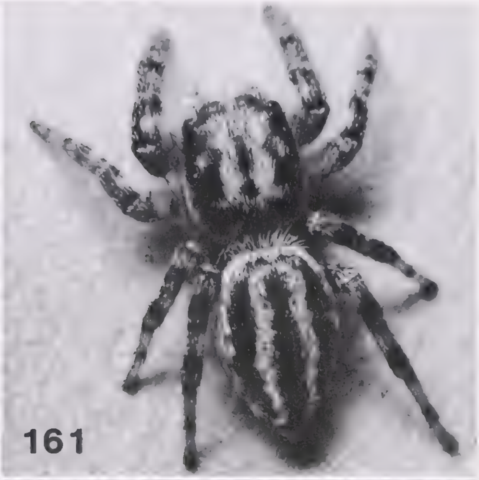
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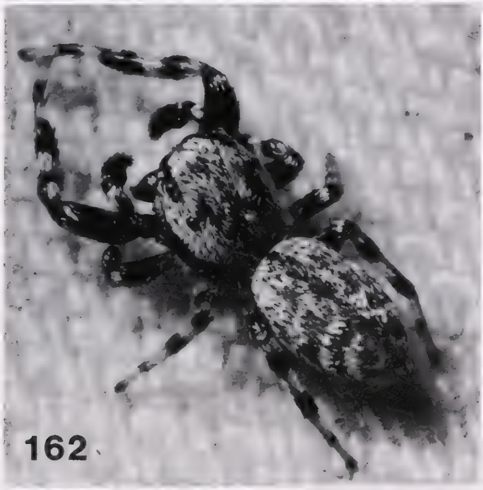
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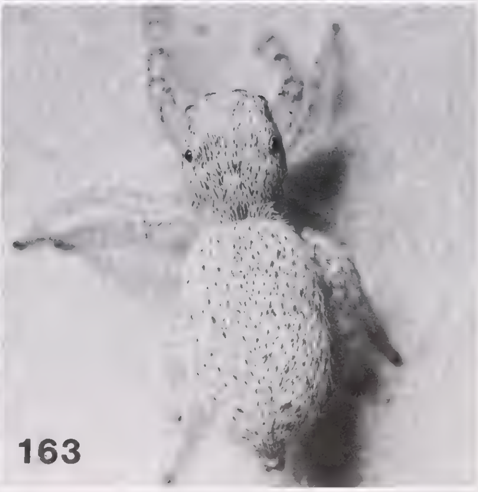
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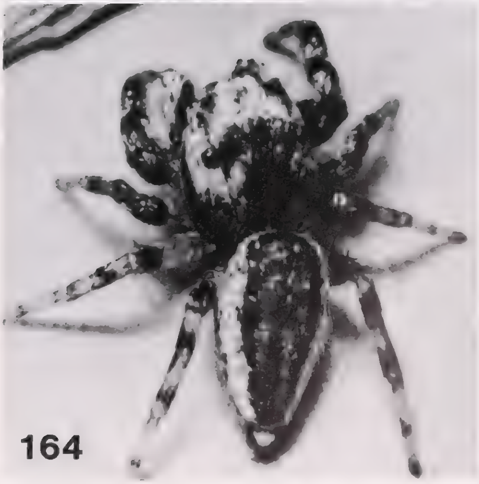
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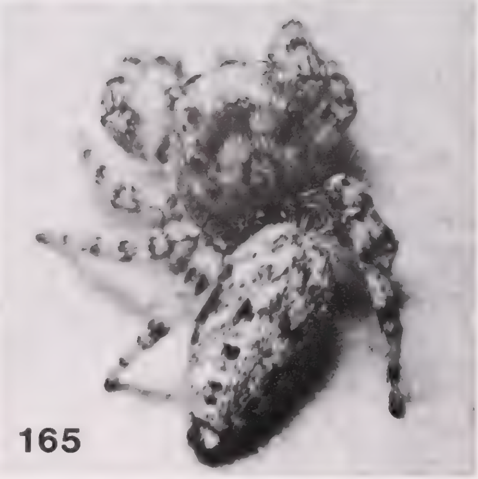
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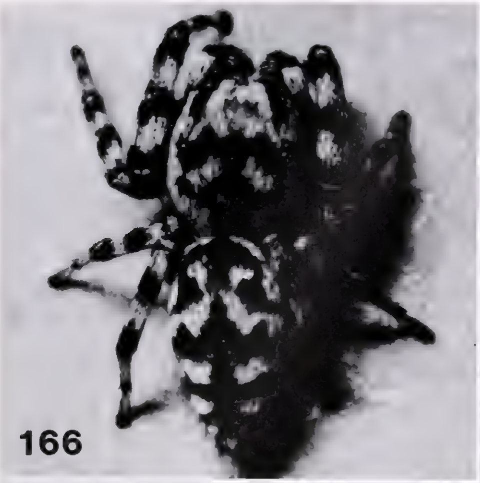
Figures 160–165. Photographs of living *Pelegrina*. 160, 161. *Pelegrina arizonensis* (sp. 28; Minnesota: Anoka Co.). 160. Male. 161. Female. 162, 163. *Pelegrina verecunda* (sp. 30; Arizona: Yavapai Co.). 162. Male. 163. Female. 164, 165. *Pelegrina clavator* (sp. 31). 164. Male (Nuevo León: Chipinque Mesa). 165. Female (Veracruz: Naolinco).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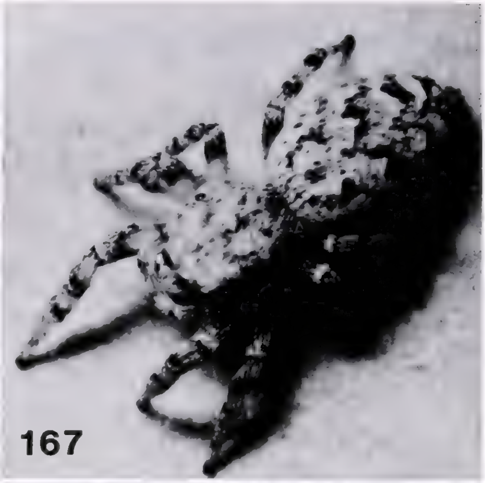
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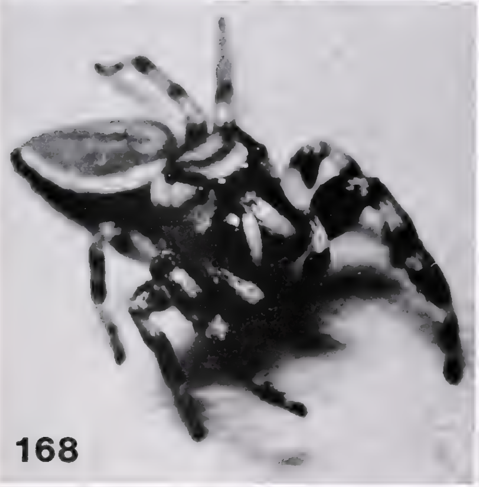
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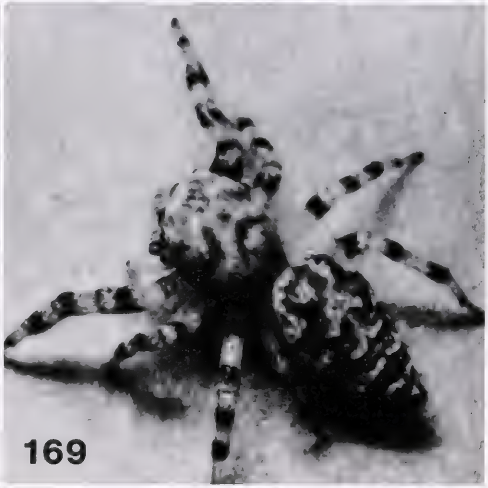
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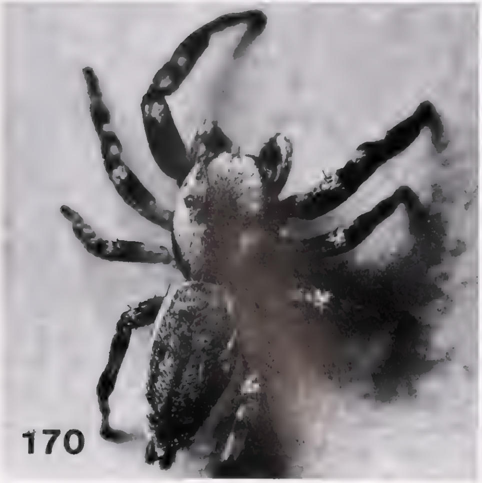
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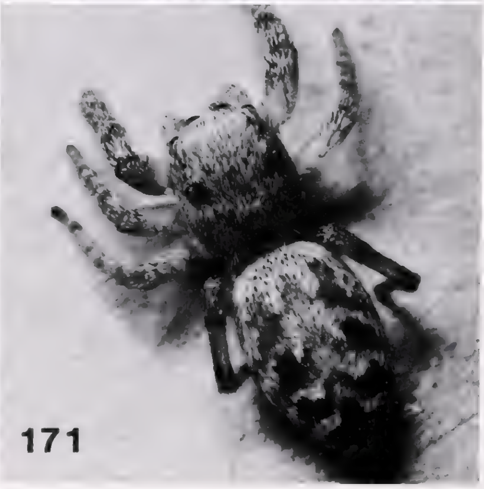
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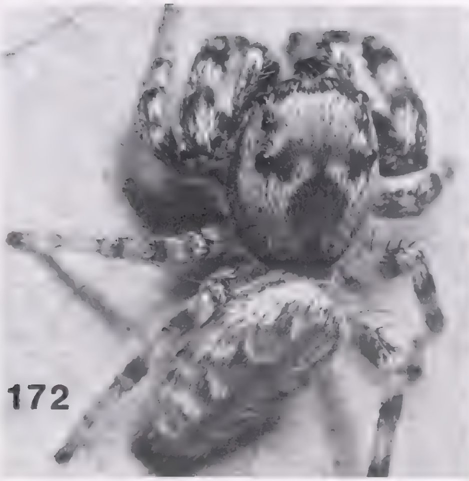
Figures 166–171. Photographs of living *Pelegrina*. 166, 167. *Pelegrina variegata* (sp. 33; Oaxaca: nr. El Tule). 166. Male. 167. Female. 168. *Pelegrina sandaracina* (sp. 35): male (holotype: Campeche: nr. Francisco Escarcega). 169. *Pelegrina yucatecana* (sp. 34): female (Campeche: Xpujil). 170, 171. *Pelegrina bunites* (sp. 37; Arizona: Mount Hopkins). 170. Male (holotype). 171. Female.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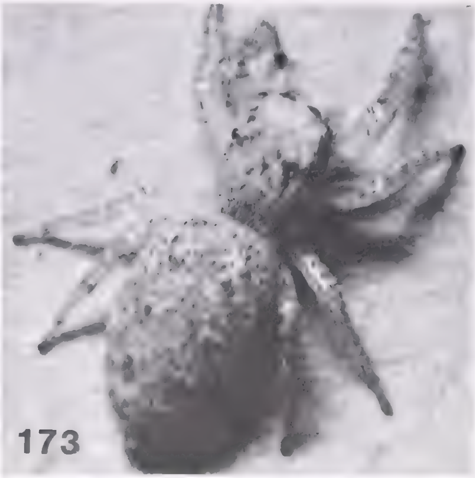
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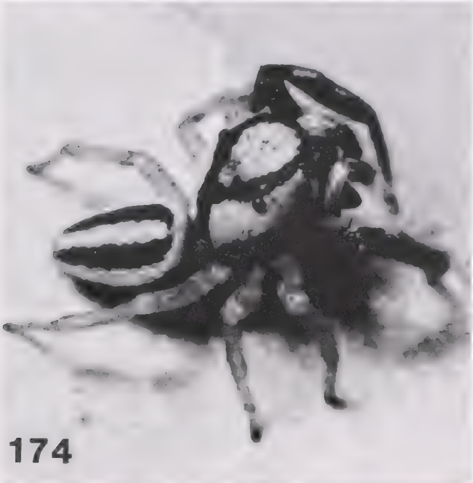
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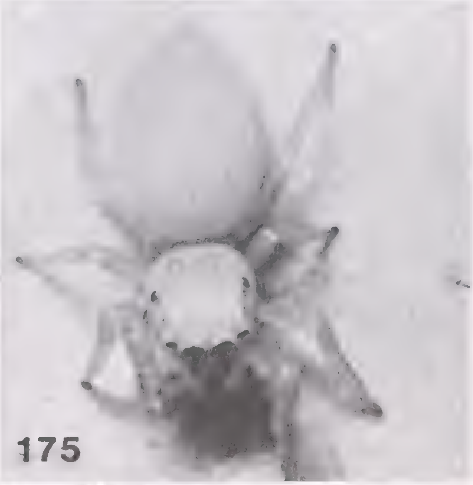
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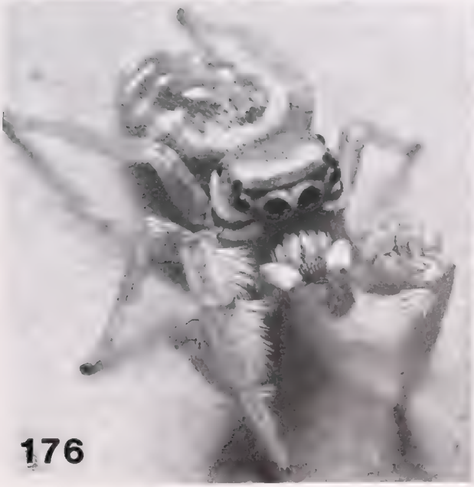
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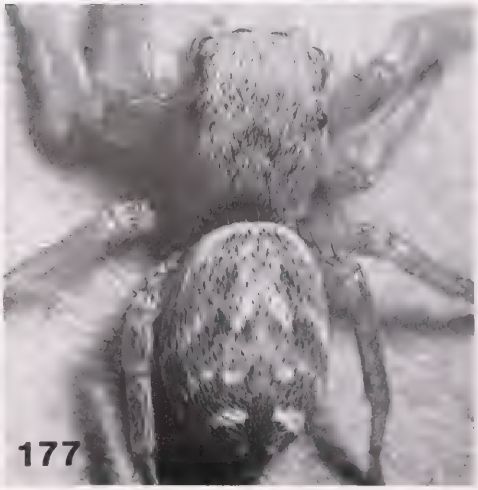
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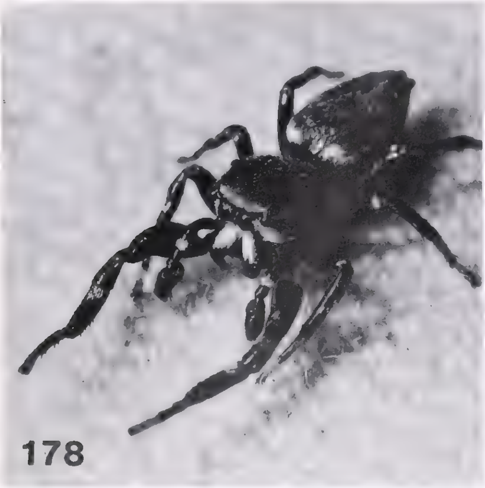
Figures 172–177. Photographs of living *Pelegrina*, *Nagaina*, and *Metaphidippus mannii* group species. 172, 173. *Pelegrina orestes* (sp. 38; Arizona: Madera Canyon). 172. Male. 173. Female. 174, 175. *Nagaina incunda* (sp. 39). 174. Male (San Luis Potosí: nr. Las Abritas). 175. Female (Tamaulipas: 99°04′W, 23°00′N). 176, 177. *Metaphidippus emmiltus* (sp. 45; New Mexico: Guadalupe Co.). 176. Male (holotype). 177. Female (paratype).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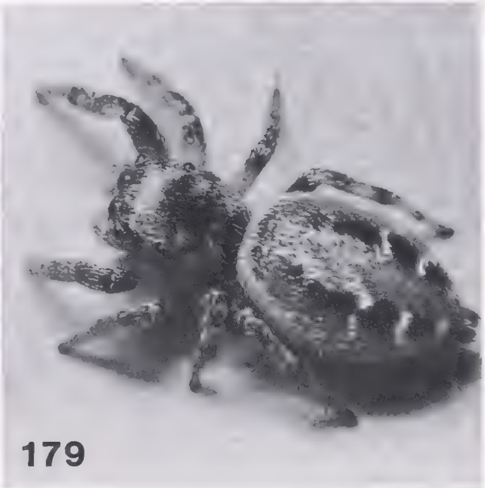
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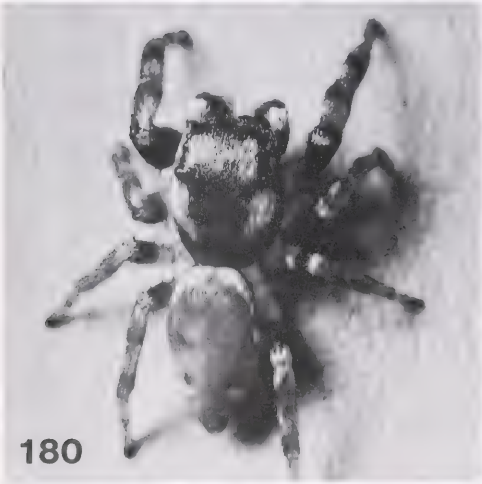
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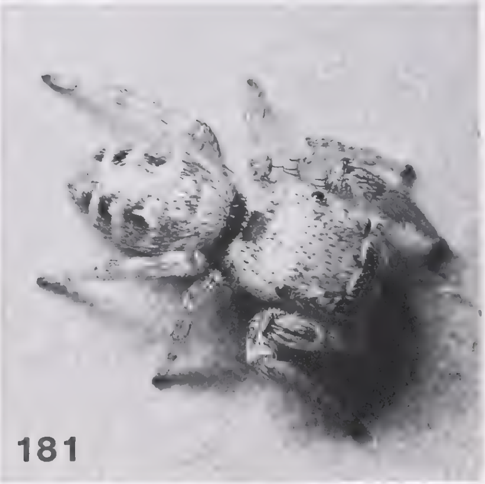
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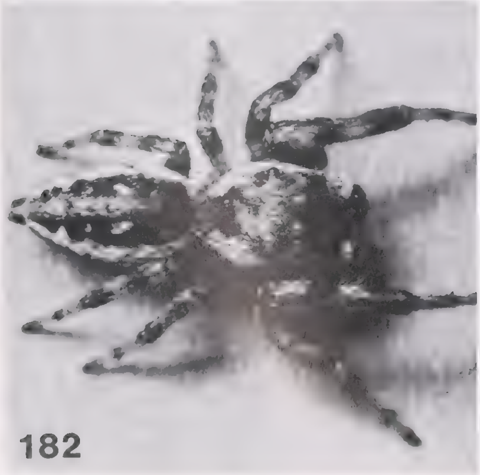
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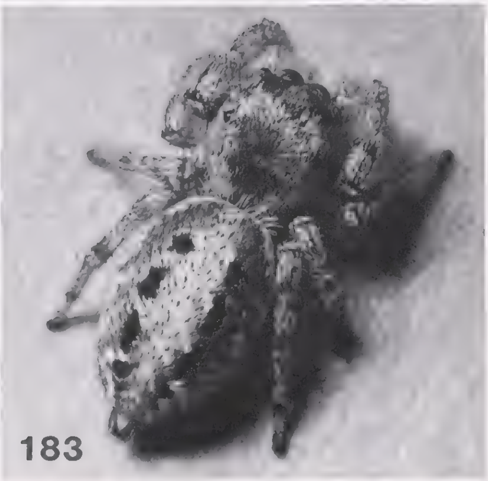
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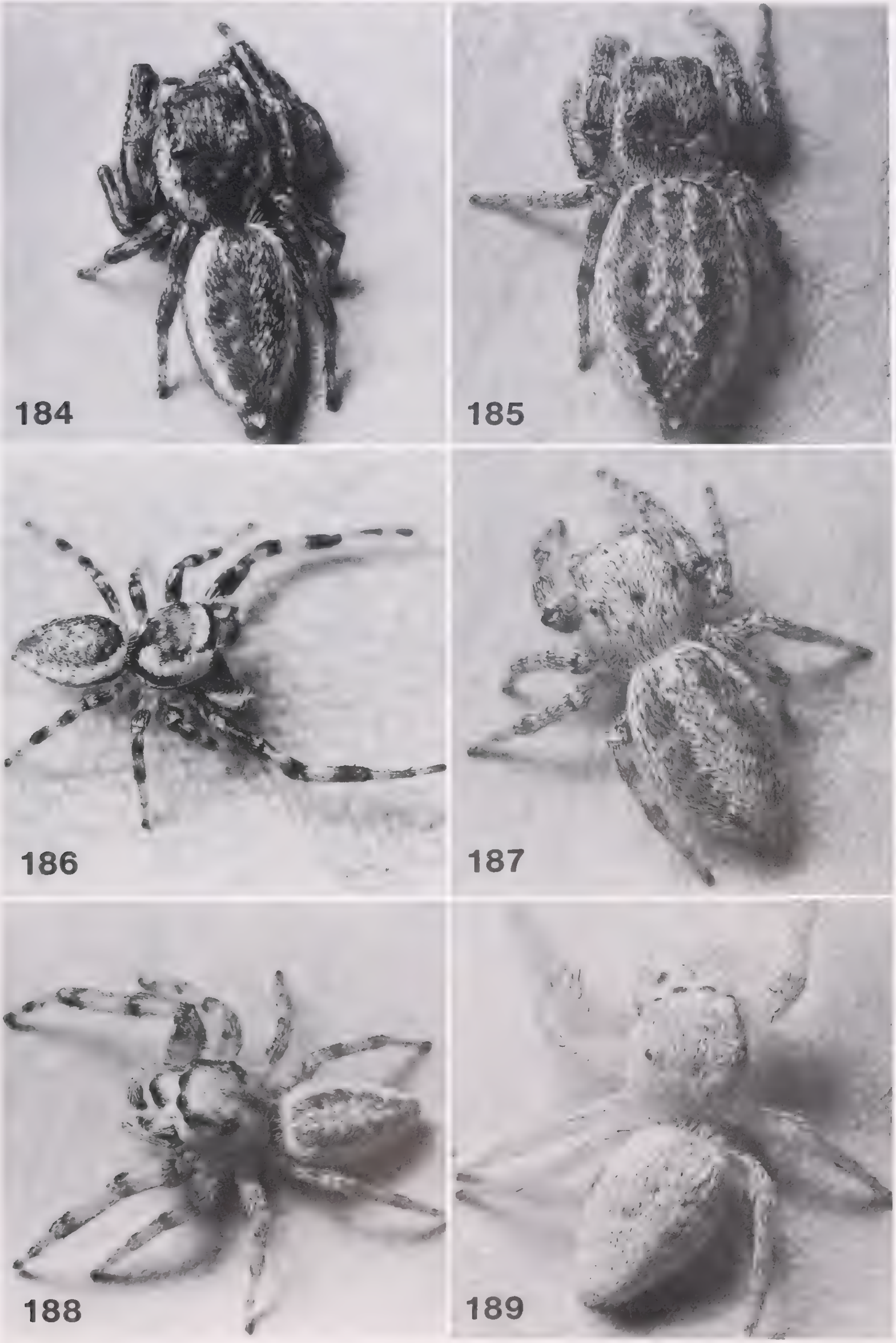
Figures 178–183. Photographs of living *Metaphidippus mannii* group species. 178, 179. *Metaphidippus mannii* (form *versicolor*) (sp. 40). 178. Male (California: Riverside Co.). 179. Female (Washington: Seattle). 180, 181. *Metaphidippus mannii* (form *mannii*) (sp. 40). 180. Male (Arizona: Sycamore Canyon). 181. Female (Arizona: Santa Catalina Mtns.). 182, 183. *Metaphidippus diplacis* (sp. 45). 182. Male (California: San Diego Co.). 183. Female (California: Santa Barbara Co.).



Figures 184–189. Photographs of living *Metaphidippus mannii* group species. 184, 185. *Metaphidippus tricolor* (sp. 42; California: Monterey Co.). 184. Male. 185. Female. 186, 187. *Metaphidippus chera* (sp. 43). 186. Male (California: San Luis Obispo Co.). 187. Female (California: Santa Barbara Co.). 188, 189. *Metaphidippus carmenensis* (sp. 44; California: Riverside Co.). 188. Male. 189. Female.

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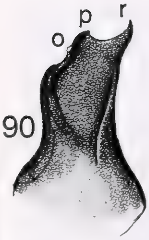

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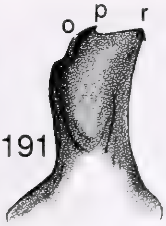

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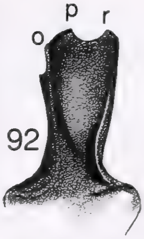

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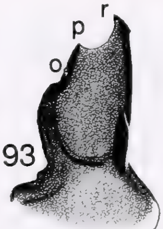

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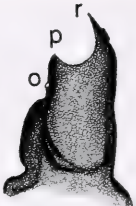

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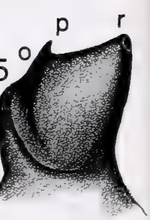

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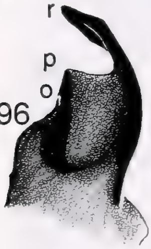

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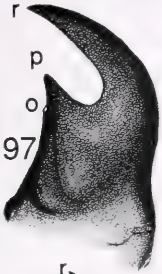

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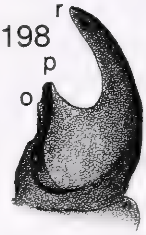

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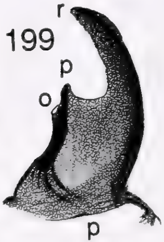

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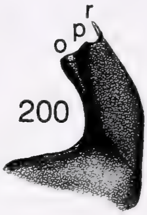

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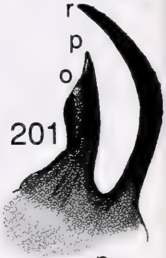

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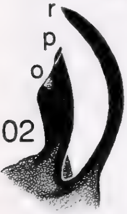

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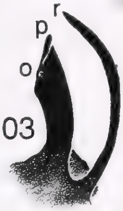

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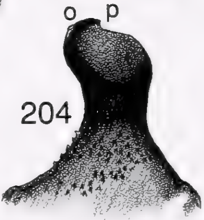

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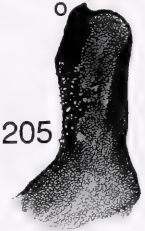

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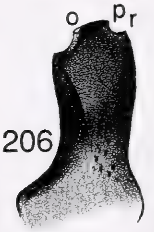

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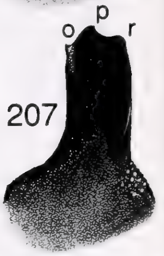

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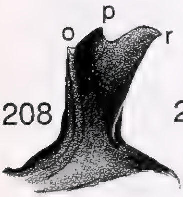

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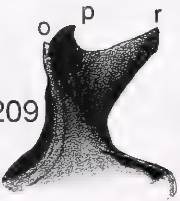

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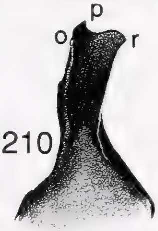

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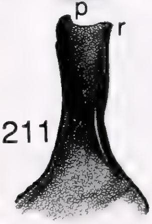

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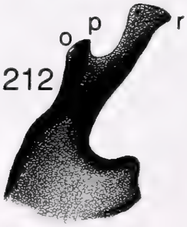

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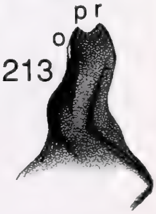

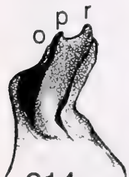

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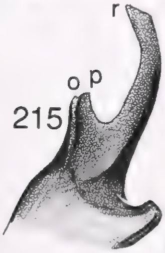

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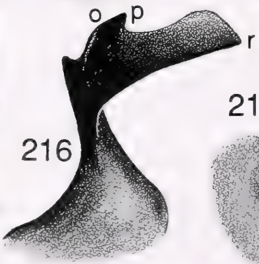

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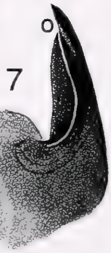

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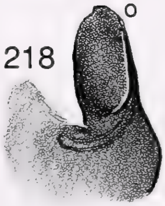

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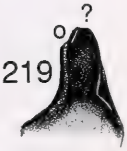

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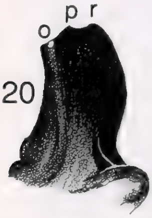

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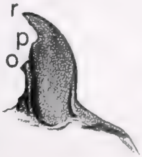

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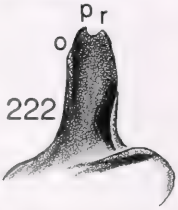

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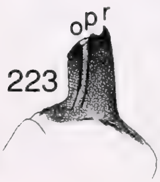

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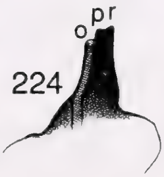

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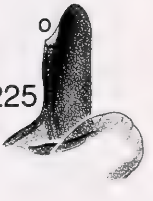

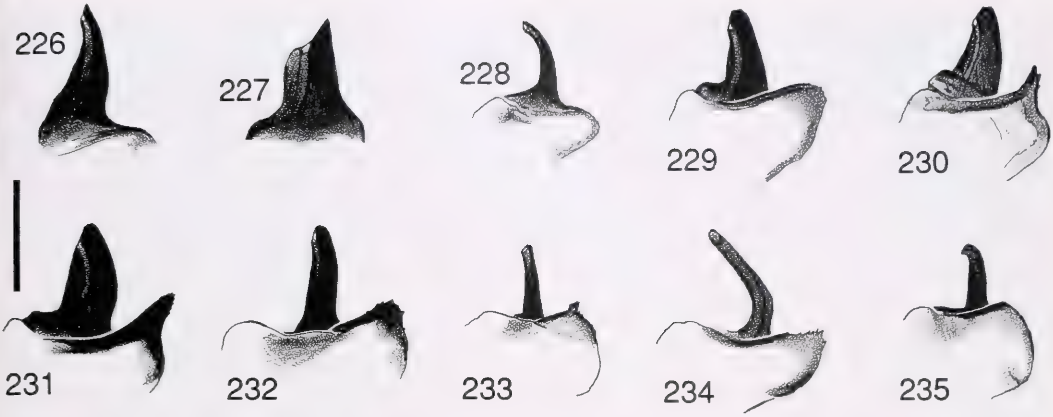

Figures 226–235. Embolus of left palpus, oblique ventral-retrolateral view, of *Pelegrina, Nagaina,* and *Metaphidippus mannii* group species. All figures to same scale; scale bar = 0.1 mm. 226. *Pelegrina bunites* (sp. 37; Arizona: Quinlan Mtns.). 227. *Pelegrina orestes* (sp. 38; Arizona: Madera Canyon). 228. *Nagaina incunda* (sp. 39; Quintana Roo: Kohunlich ruins). 229. *Metaphidippus mannii* (form *versicolor*) (sp. 40; California: Riverside Co.). 230. *Metaphidippus mannii* (form *mannii*) (sp. 40; Arizona: Santa Cruz Co.). 231. *Metaphidippus diplacis* (sp. 41; California: San Diego). 232. *Metaphidippus tricolor* (sp. 42; California: Monterey Co.). 233. *Metaphidippus chera* (sp. 43; Arizona: Pima Co.). 234. *Metaphidippus carmenensis* (sp. 44; Baja California Norte: Isla Angel de al Guardia). 235. *metaphidippus emmiltus* (sp. 45; holotype).

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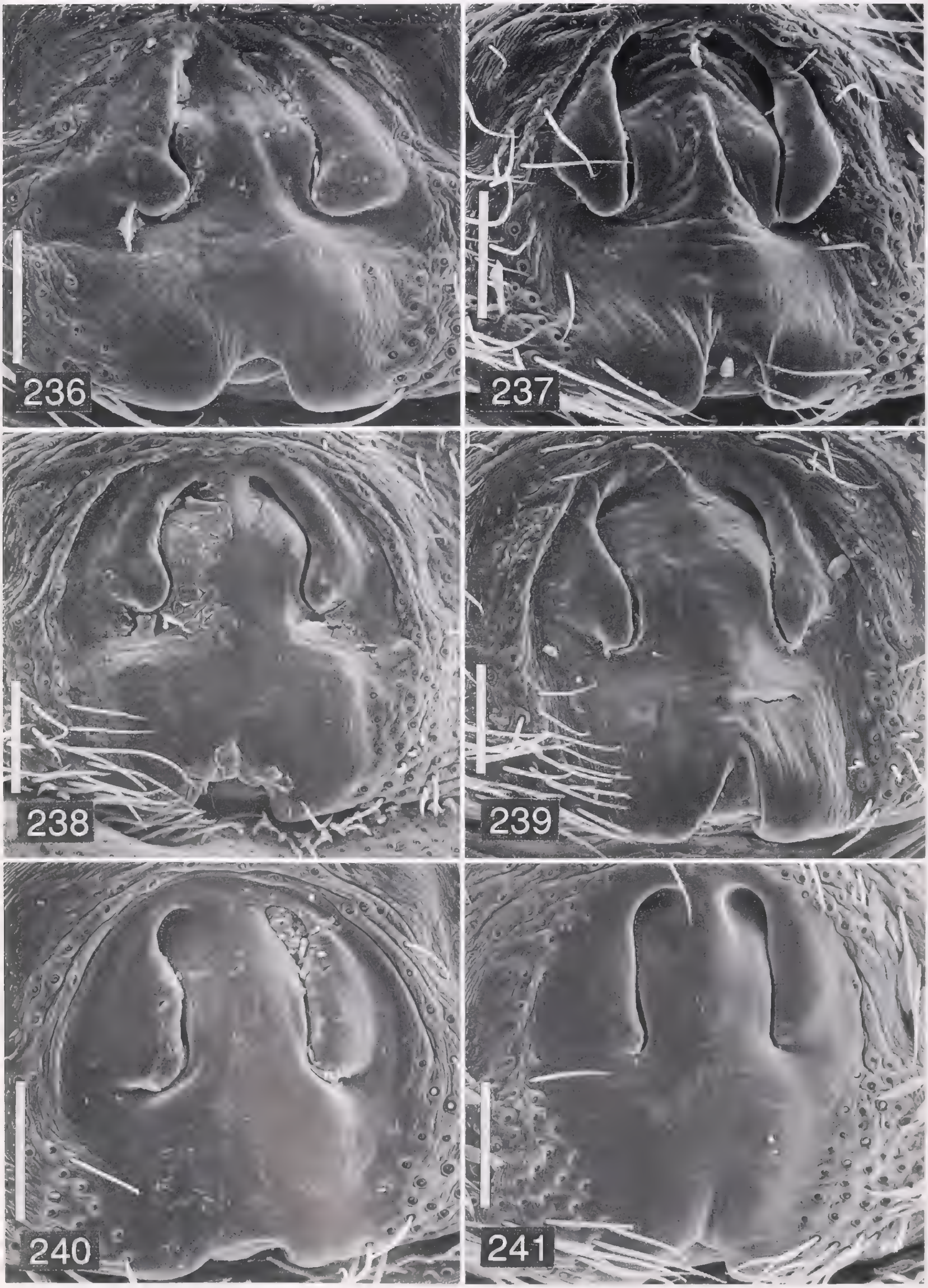
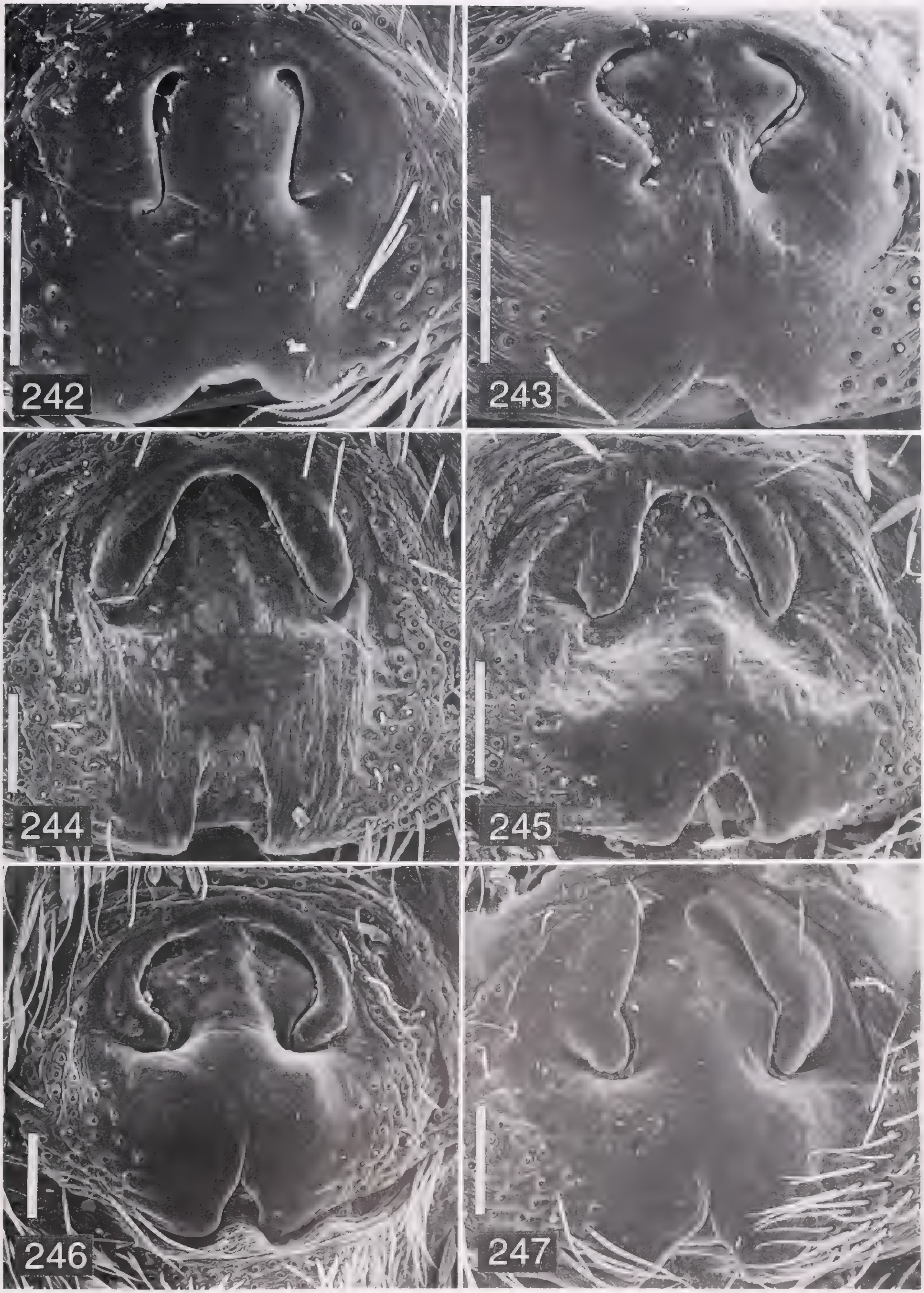
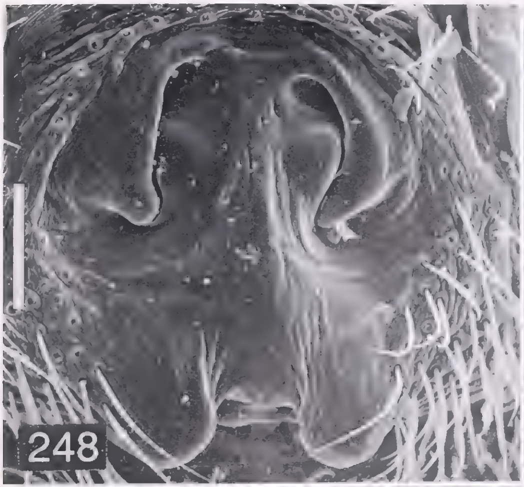
Figures 190–225. Embolus of left palpus, oblique ventral-retrolateral view, of *Pelegrina* species. The opening to the sperm duct, the prolateral ramus, and retrolateral ramus are labeled with "o," "p," and "r," respectively. All figures to same scale; scale bar 0.1 mm. 190. *P. galathea* (sp. 1; Chihuahua: 105.2°W, 27.9°N). 191. *P. proxima* (sp. 2 Cuba: Holquin). 192. *P. dithalea* (sp. 3; Arizona: Santa Cruz Co.). 193. *P. edrilana* (sp. 4; Distrito Federal: Tlalpam). 194. *P. protervav* (sp. 5; Ontario: Kenora District). 195. *P. peckhamorum* (sp. 6; Massachusetts: Barnstable Co.). 196. *P. neoleonis* (sp. 7; Nuevo León: Chipinque Mesa). 197. *P. tristis* (sp. 8; Arizona: Chiricahua Mtns.). 198. *P. sabinema* (sp. 9; Arizona: Coconino Co.). 199. *P. pervaga* (sp. 10; Texas: Erath Co.). 200. *P. kastoni* (sp. 11; Arizona: Chiricahua Mtns.). 201. *P. flavipedes* (sp. 12; Manitoba: 19 km E of Neepawa). 202. *P. flaviceps* (sp. 13; Maine: Sagadahoc Co.). 203. *P. exigua* (sp. 14; Massachusetts: Barnstable Co.). 204. *P. montana* (sp. 15; New Hampshire: Jeffrey). 205. *P. insignis* (sp. 16; Saskatchewan: North Battleford). 206. *P. chaimona* (sp. 17; Arizona: Chiricahua Mtns.). 207. *P. clemata* (sp. 18; Alberta: Morrin Recreational Area). 208. *P. aeneola* (*aeneola*) (sp. 19; Oregon: Lane Co.). 209. *P. aeneola* (*uteanus*) (sp. 19; South Dakota: Custer Co.). 210. *P. balia* (sp. 20; Oregon: Deschutes Co.). 211. *P. chalceola* (sp. 21; Arizona: Chiricahua Mtns.). 212. *P. furcata* (sp. 22; Arizona: Santa Rita Mtns.). 213. *P. volcana* (sp. 23; Panamá: El Volcán). 214. *P. bicuspidata* (sp. 24; right palp, image photographically reversed) (holotype; Guatemala). 215. *P. morelos* (sp. 26; holotype; Morelos: nr. Cernavaca). 216. *P. huachuca* (sp. 27; holotype; Arizona: Huachuca Mtns.). 217. *P. arizonensis* (sp. 28; New Mexico: Bernalillo Co.). 218. *P. helenae* (sp. 29; Oregon: nr. Prineville). 219. *P. verecunda* (sp. 30; Arizona: Yavapai Co.). 220. *P. clavator* (sp. 31; Nuevo León: Chipinque Mesa). 221. *P. pallidata* (sp. 32; Nicaragua: Matagalpa). 222. *P. variegata* (sp. 33; Oaxaca: El Tule). 223. *P. yucatecana* (sp. 34; holotype; Yucatán: Chichen Itza). 224. *P. sandaracina* (sp. 35; Holotype; Campeche: Francisco Escarcega). 225. *P. tillandsiae* (sp. 36; South Carolina: Cooper).



Figures 236–241. Scanning electron micrographs of female epigyna of *Pelegrina* species. View is mostly ventral, slightly oblique lateral. Scale bars 0.1 mm. 236. *P. galathea* (sp. 1; Michigan: Washtenaw Co.). 237. *P. proxima* (sp. 2; Cuba: Havana). 238. *P. proterva* (sp. 5; Iowa: Hancock Co.). 239. *P. peckhamorum* (sp. 6; Arkansas: Washington Co.). 240. *P. pervaga* (sp. 10; Texas: Erath Co.). 241. *P. flavipedes* (sp. 12; Alberta: Edmonton).



Figures 242–247. Scanning electron micrographs of female epigyna of *Pelegrina* species. View is mostly ventral, slightly oblique lateral. Scale bars 0.1 mm. 242. *P. flaviceps* (sp. 13; Maine: Sagadahoc Co.). 243. *P. exigua* (sp. 14; Virginia: Shenandoah Co.). 244. *P. montana* (sp. 15; Colorado: Boulder Co.). 245. *P. insignis* (sp. 16; New Hampshire: Cheshire Co.). 246. *P. clemata* (sp. 18; Colorado: Gunnison Co.). 247. *P. aeneola* (sp. 19; Oregon: Lane Co.).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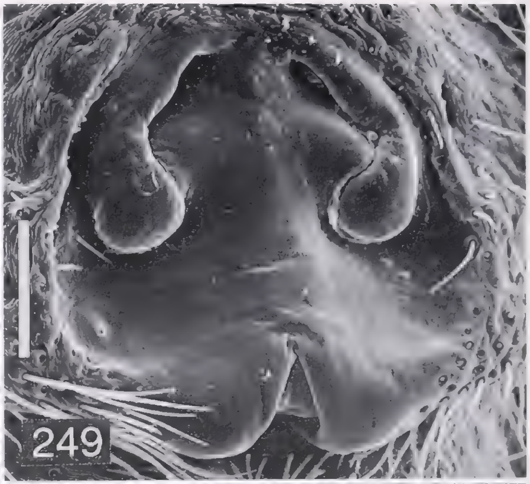
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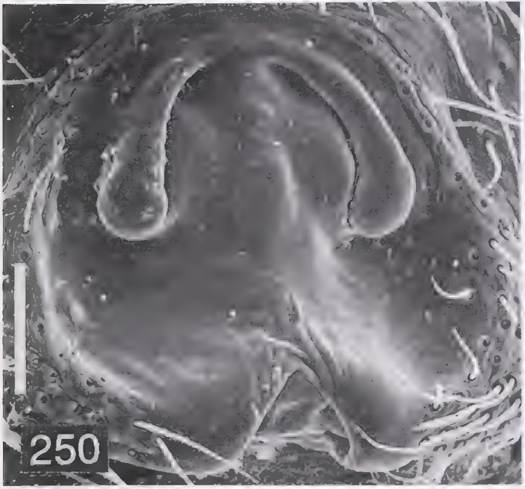
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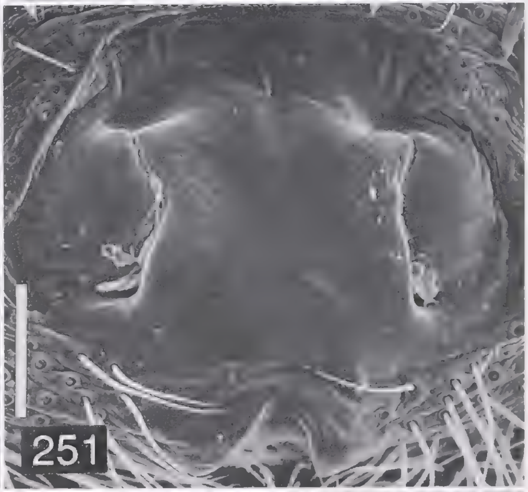
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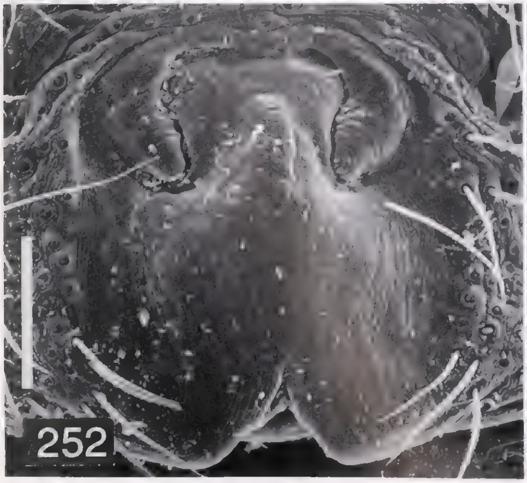
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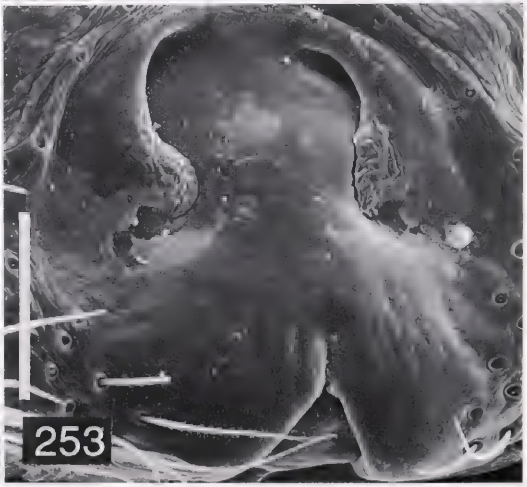
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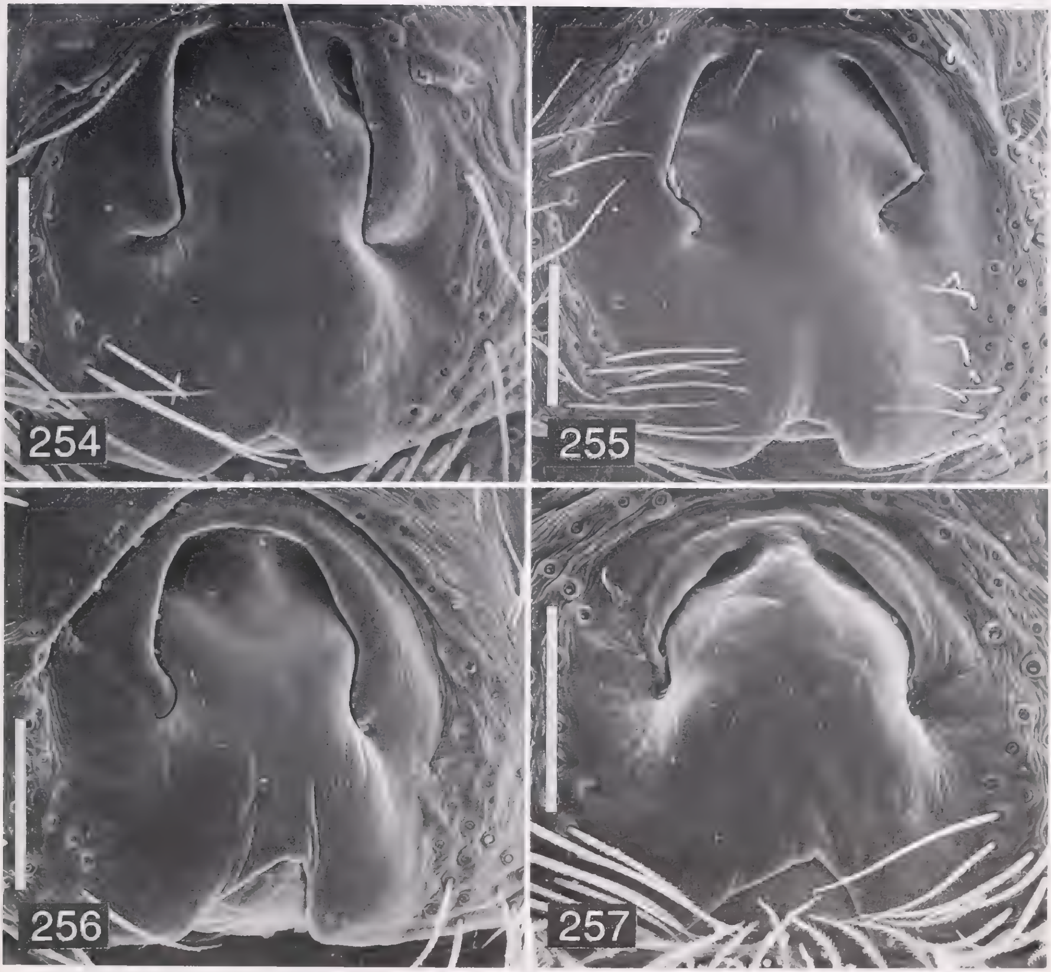

Figures 254–257. Scanning electron micrographs of female epigyna of *Pelegrina* and *Metaphidippus mannii* group species. View is mostly ventral, slightly oblique lateral. Scale bars 0.1 mm. 254. *P. tillandsiae* (sp. 36; South Carolina: Cooper). 255. *P. bunites* (sp. 37; Arizona: Mount Hopkins). 256. *Metaphidippus mannii* (sp. 40; Oregon: Lane Co.). 257. *Metaphidippus chera* (sp. 43; Arizona: Pima Co.).

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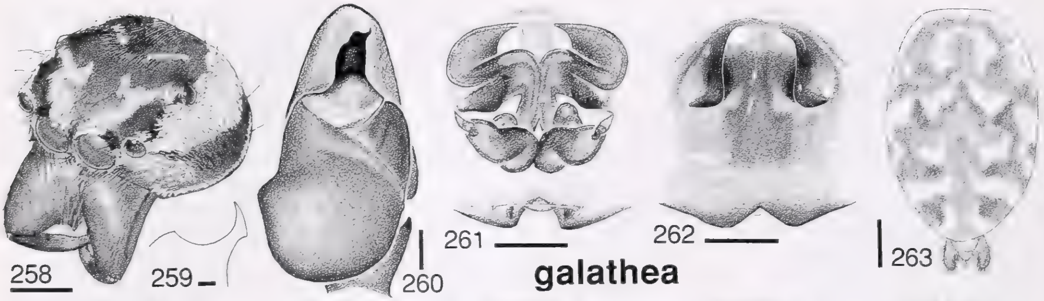
Figures 248–253. Scanning electron micrographs of female epigyna of *Pelegrina* species. View is mostly ventral, slightly oblique lateral. Scale bars 0.1 mm. 248. *P. balia* (sp. 20; California: Plumas Co.). 249. *P. furcata* (form *mimus*; sp. 22; Arizona: Yavapai Co.). 250. *P. furcata* (sp. 22; Arizona: Yavapai Co.). 251. *P. arizonensis* (sp. 28; Minnesota: Anoka Co.). 252. *P. verecunda* (sp. 30; Arizona: Yavapai Co.). 253. *P. variegata* (sp. 33; Oaxaca: El Tule).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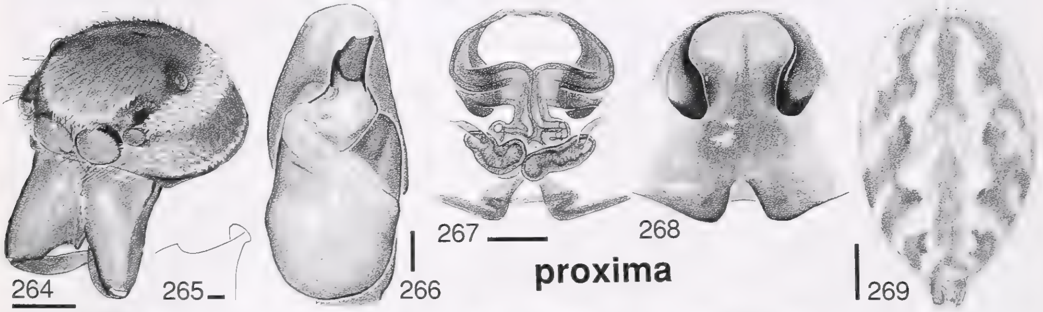
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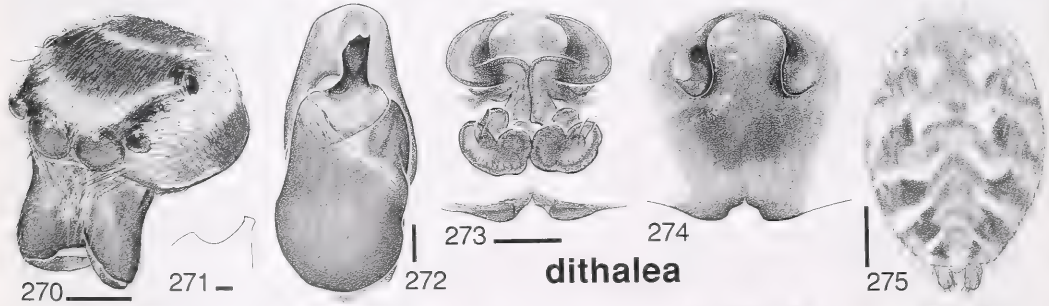
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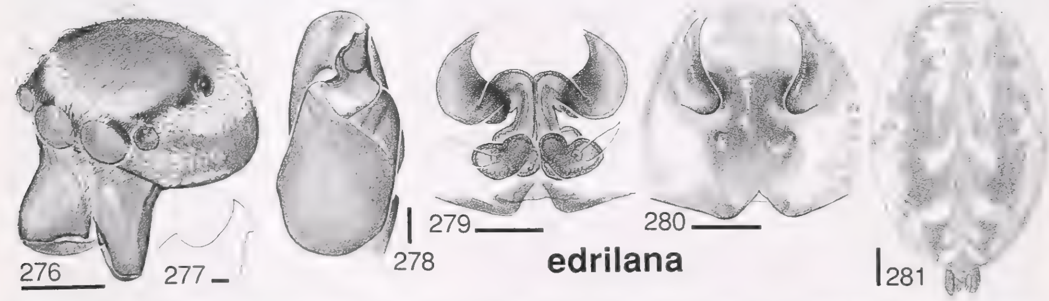
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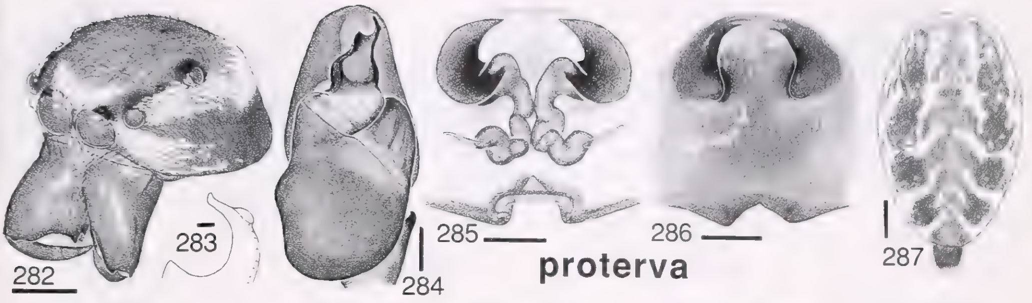
Figures 258–263. *Pelegrina galathea* (sp. 1). 258. ♂ face (Texas: San Patricio Co.). 259. Tip of embolus (Florida: Sebastian). 260. Palp (Ontario: Bruce Co.). 261, 262. Epigynum, dorsal (261) and ventral (262) (Arkansas: Washington Co.). 263. ♀ abdomen (Pennsylvania, Erie Co.).

Figures 264–269. *Pelegrina proxima* (sp. 2). 264. ♂ face (Jamaica: St. Andrew: Mona). 265. Tip of embolus (Cuba: Havana). 266. Palp (holotype; Cuba); 267, 268. Epigynum, dorsal (267) and ventral (268) (Cuba: Havana). 269. ♀ abdomen (Cuba: Soledad).

Figures 270–275. *Pelegrina dithalea* (sp. 3; Arizona: Santa Cruz Co., Sycamore Canyon). 270. ♂ face (holotype). 271. Tip of embolus. 272. Palp. 273, 274. Epigynum, dorsal (273) and ventral (274). 275. ♀ abdomen.

Figures 276–281. *Pelegrina edrilana* (sp. 4). 276–278. Holotype. 276. ♂ face. 277. Tip of embolus. 278. Palp. 279. Epigynum, dorsal (Oaxaca: nr. El Tule). 280. Epigynum, ventral (Distrito Federal: San Jeronimo; see also Fig. 4). 281. ♀ abdomen (Distrito Federal: San Jeronimo).

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm and tip of embolus 0.01 mm.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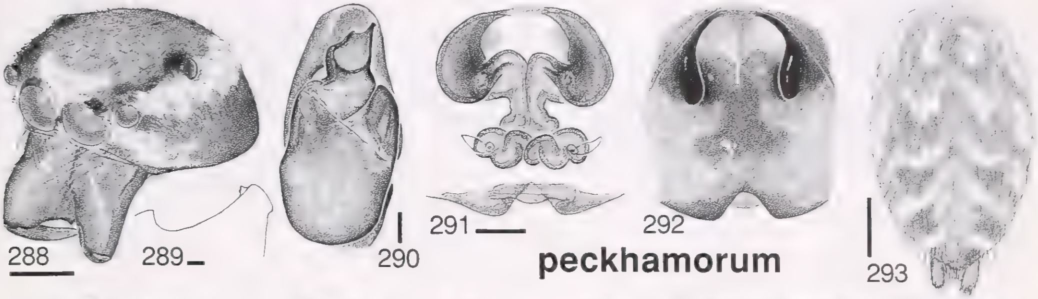
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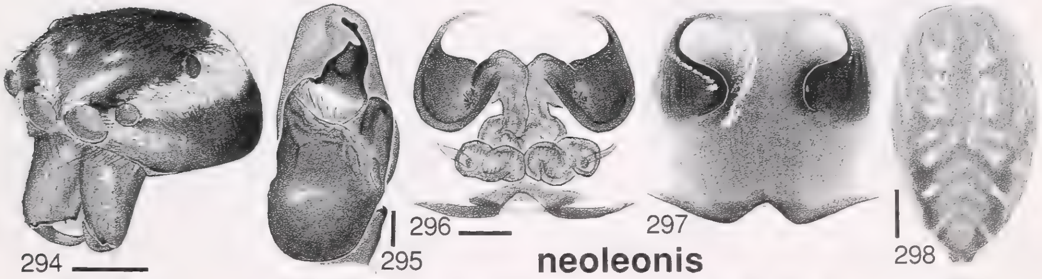
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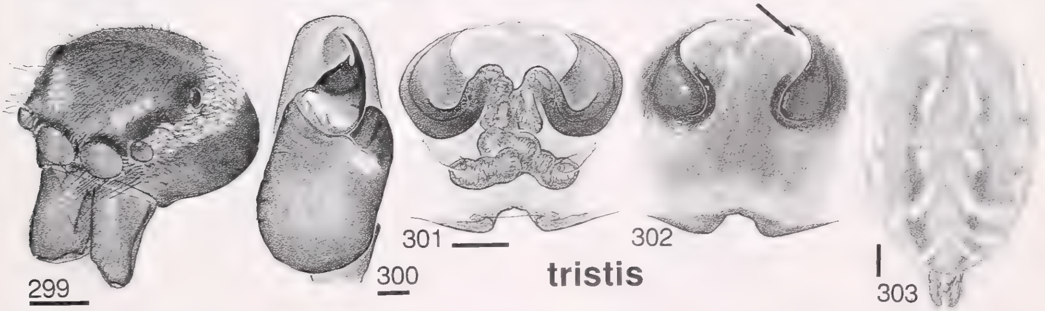
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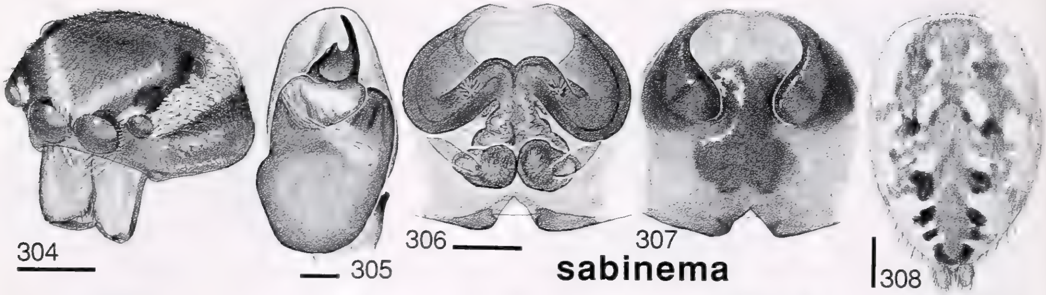
Figures 282–287. *Pelegrina proterva* (sp. 5). 282. ♂ face (Massachusetts: Dukes Co.). 283. Tip of embolus (Massachusetts: Middlesex Co.). 284. Palp (Ontario: near Barrie). 285. Epigynum, dorsal (Ontario: Muskoka District). 286. Epigynum, ventral (Iowa: Hancock Co.). 287. ♀ abdomen (Michigan: Mackinac Co.).

Figures 288–293. *Pelegrina peckhamorum* (sp. 6; Arkansas, except 289 and 293 Massachusetts). 288. ♂ face. 289. Tip of embolus. 290. Palp. 291. Epigynum, dorsal. 292. Epigynum, ventral. 293. ♀ abdomen.

Figures 294–298. *Pelegrina neoleonis* (sp. 7). 294. ♂ face (Chipinque Mesa). 295. Palp (Cerro Potosí). 296, 297. Epigynum, dorsal (296) and ventral (297) (Cerro Potosí). 298. ♀ abdomen (Oaxaca).

Figures 299–303. *Pelegrina tristis* (sp. 8). 299. ♂ face (holotype). 300. Palp (holotype). 301, 302. Epigynum, dorsal (301) and ventral (302) (paratype; arrow shows pale surface that descends deeply). 303. ♀ abdomen (Arizona: Madera Canyon).

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm and tip of embolus 0.01 mm.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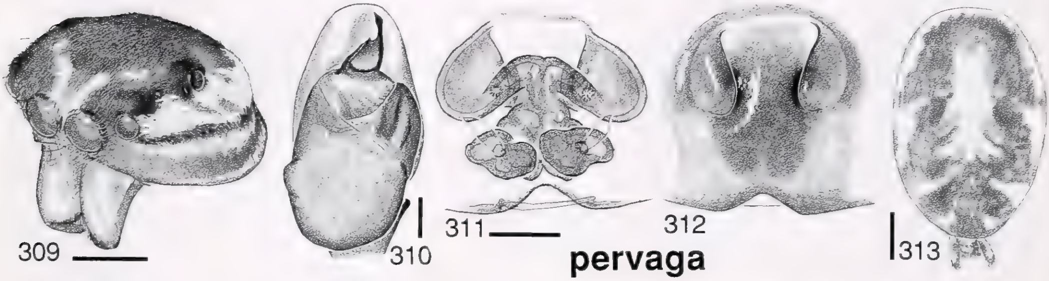
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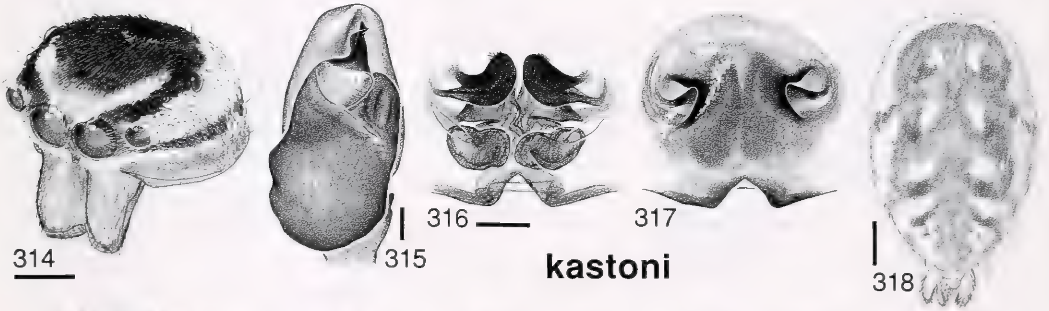
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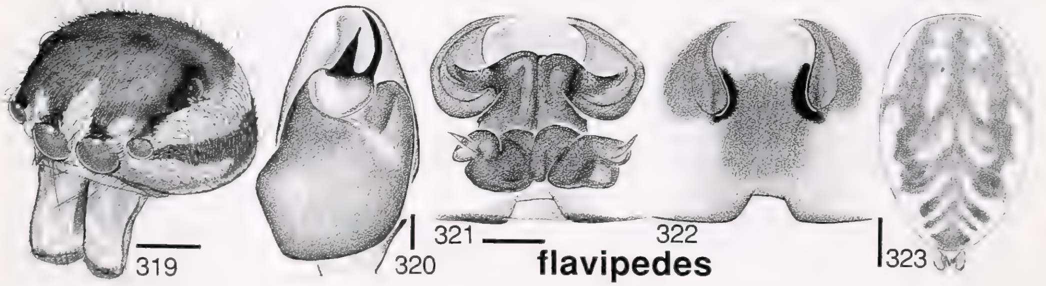
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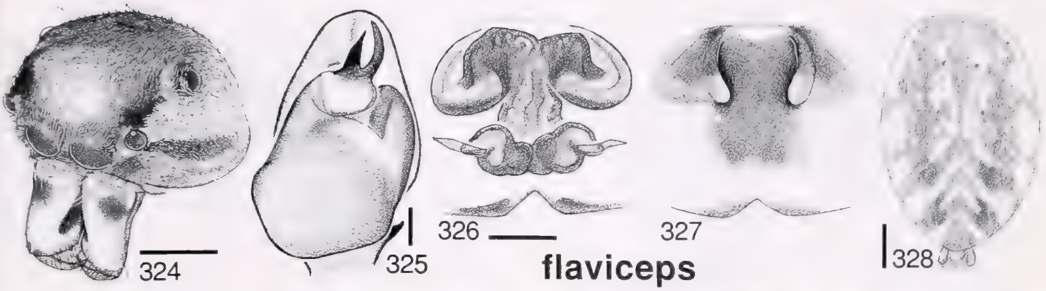
Figures 304–308. *Pelegrina sabinema* (sp. 9). 304. ♂ face (New Mexico: Santa Fe Co.). 305. Palp (Arizona: Coconino Co.). 306, 307. Epigynum, dorsal (306) and ventral (307) (New Mexico: Santa Fe Co.). 308. ♀ abdomen (New Mexico: nr. Edgewood).

Figures 309–313. *Pelegrina pervaga* (sp. 10). 309. ♂ face (Texas: Kerr Co.). 310. Palp (Texas: Kerr Co.). 311, 312. Epigynum, dorsal (311) and ventral (312) (Texas: Val Verde Co.). 313. ♀ abdomen (Texas: Val Verde Co.).

Figures 314–318. *Pelegrina kastoni* (sp. 11). 314. ♂ face (Arizona: Sycamore Canyon). 315. Palp (Arizona: Chiricahua Mtns.). 316, 317. Epigynum, dorsal (316) and ventral (317) (Arizona: nr. Cienega Lake). 318. ♀ abdomen (Arizona: Madera Canyon).

Figures 319–323. *Pelegrina flavipedes* (sp. 12). 319. ♂ face (Alberta: Cypress Hills). 320. Palp (Ontario: Muskoka District). 321, 322. Epigynum, dorsal (321) and ventral (322) (Ontario: Bruce Co.). 323. ♀ abdomen (Michigan: Crawford Co.). See also Figures 338 and 339.

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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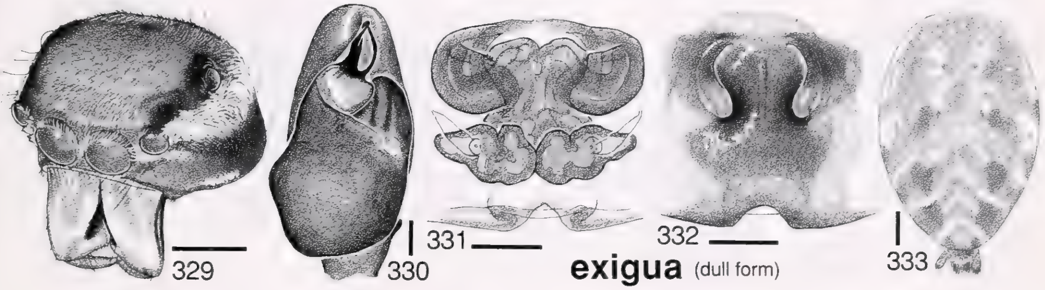
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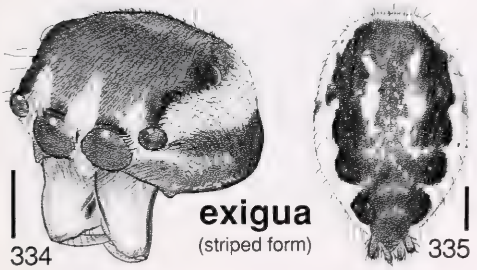
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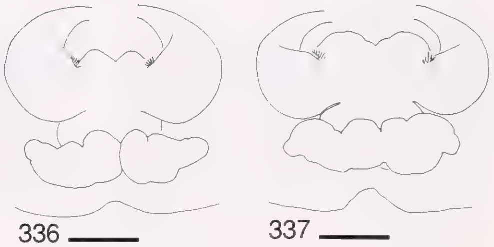

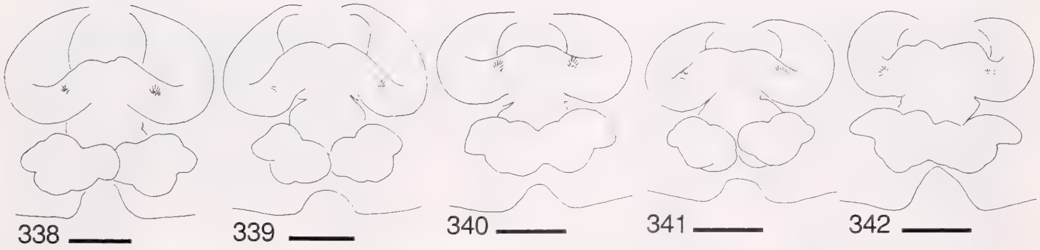
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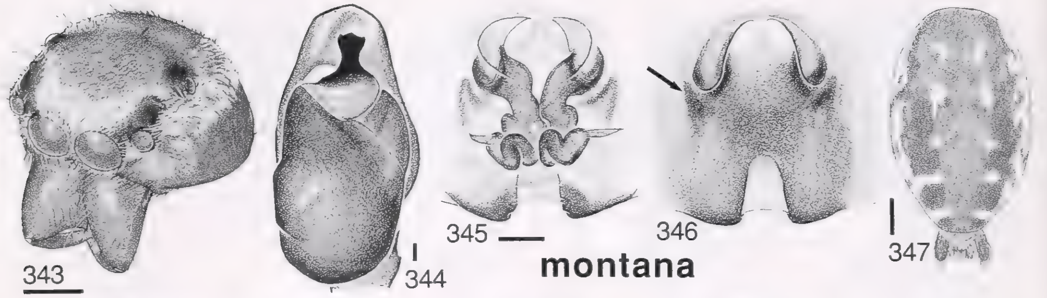
Figures 324–328. *Pelegrina flaviceps* (sp. 13; Ontario: Kingston, except 324 New Hampshire: Surry). 324. ♂ face. 325. Palp. 326. Epigynum, dorsal. 327. Epigynum, ventral. 328. ♀ abdomen. See also Figures 340 and 341.

Figures 329–335. *Pelegrina exigua* (sp. 14). 329–333. Dull form (Virginia: Shenandoah Co., except 333 Kentucky: Rowan Co.). 329. ♂ face. 330. Palp. 331. Epigynum, dorsal. 332. Epigynum, ventral. 333. ♀ abdomen. 334, 335. Striped form. 334. ♂ face (Maryland: Montgomery Co.). 400. ♀ abdomen (Missouri: Jefferson City). See also Figures 336, 337, and 342.

Figures 336–342. Spermathecal ducts of cleared epigyna, dorsal view, of *flavipedes* group species. 336, 337, 342. *P. exigua* (336, North Carolina: Durham Co.; 337, Kentucky: Rowan Co.; 342, holotype, New York: Ithaca). 338, 339. *P. flavipedes* (338, Ontario: Sudbury District; 339, Manitoba: Neepawa). 340, 341. *P. flaviceps* 340, Maine: Sagadahoc Co.; 341, New Hampshire: Strafford Co.

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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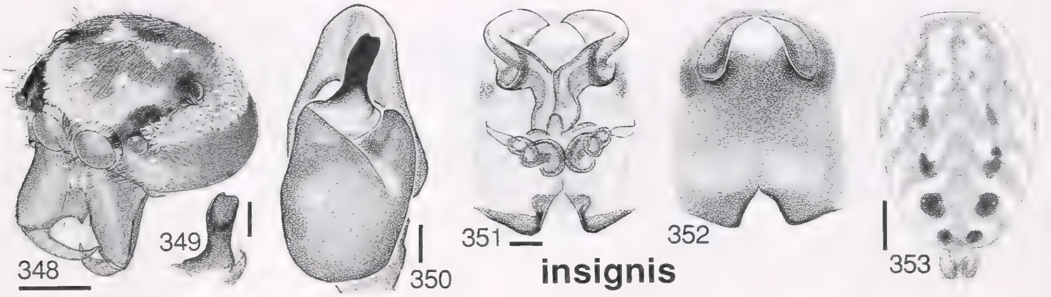
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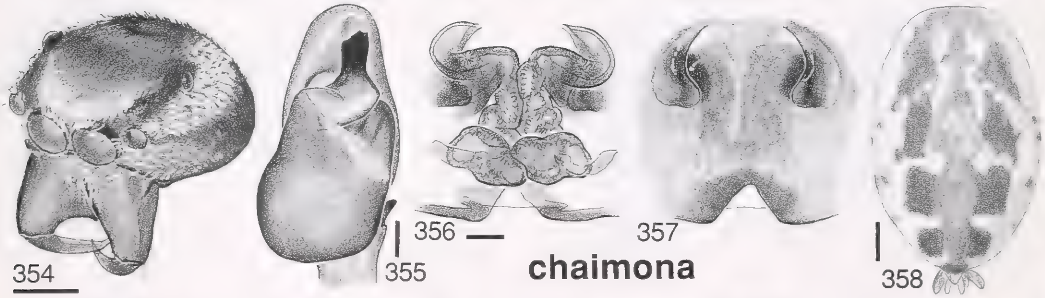
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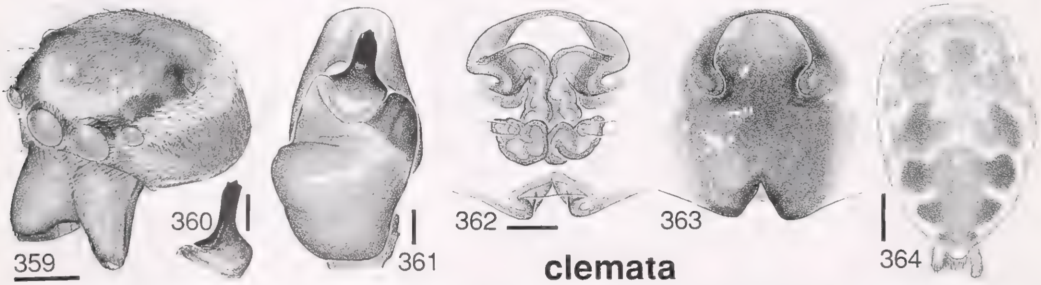
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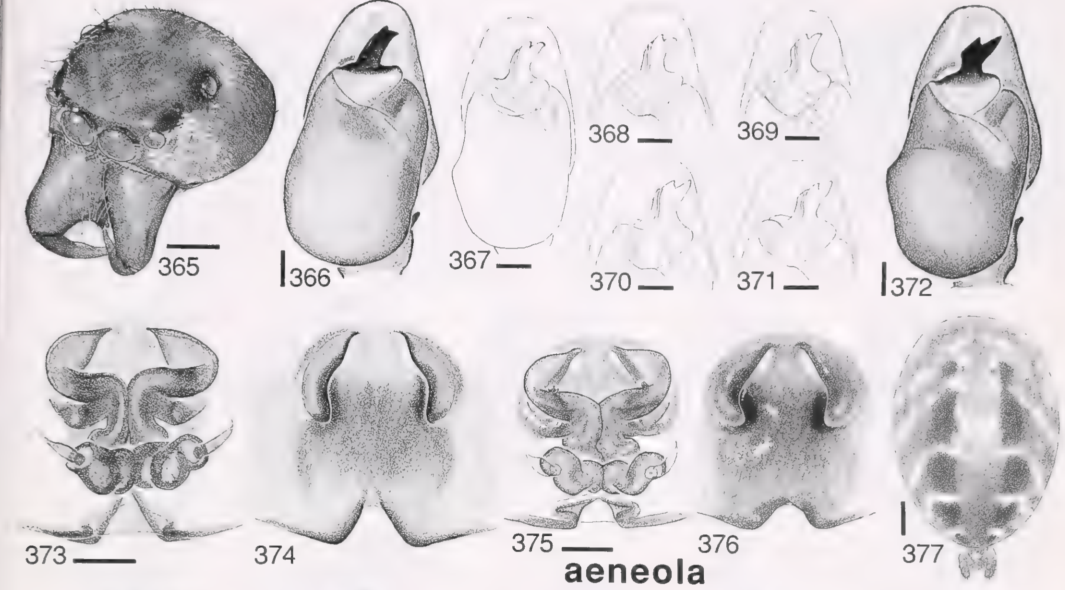
Figures 343–347. *Pelegrina montana* (sp. 15). 343. ♂ face (Vermont: Chittendon Co.). 344. Palp (Alberta: Waterton Lake). 345, 346. Epigynum, dorsal (345) and ventral (346) (Northwest Territories: Sawmill Bay). 347. ♀ abdomen (British Columbia: Pink Mtn.).

Figures 348–353. *Pelegrina insignis* (sp. 16). 348. ♂ face (New Brunswick: nr. Chipman). 349. Embolus (Michigan: Midland Co.). 350. Palp (Ontario: Barrie). 351, 352. Epigynum, dorsal (351) and vental (352) (Barrie). 353. ♀ abdomen (Minnesota: Olmsted Co.).

Figures 354–358. *Pelegrina chaimona* (sp. 17). 354. ♂ face (holotype). 355. Palp (holotype). 356, 357. Epigynum, dorsal (356) and ventral (357) (Arizona: Cochise Co.). 358. ♀ abdomen (Arizona: Cochise Co.).

Figures 359–364. *Pelegrina clemata* (sp. 18; Colorado: Saguache Co., except 359 Colorado: Gunnison Co. and 360 Washington: Yakima Co.). 359. ♂ face. 360. Embolus. 361. Palp. 362. Epigynum, dorsal. 363. Epigynum, ventral. 364. ♀ abdomen.

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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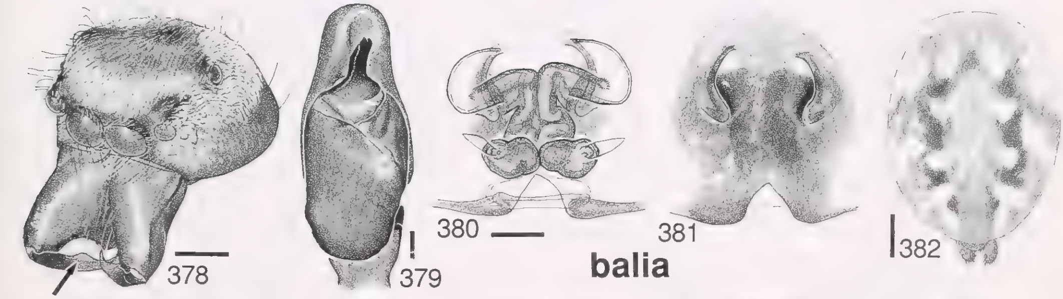
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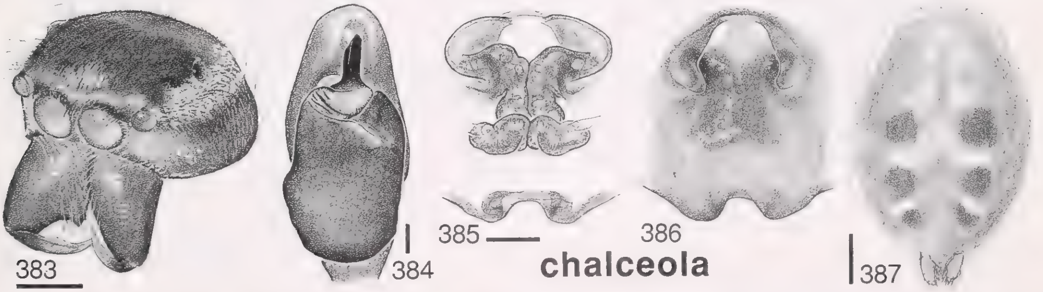
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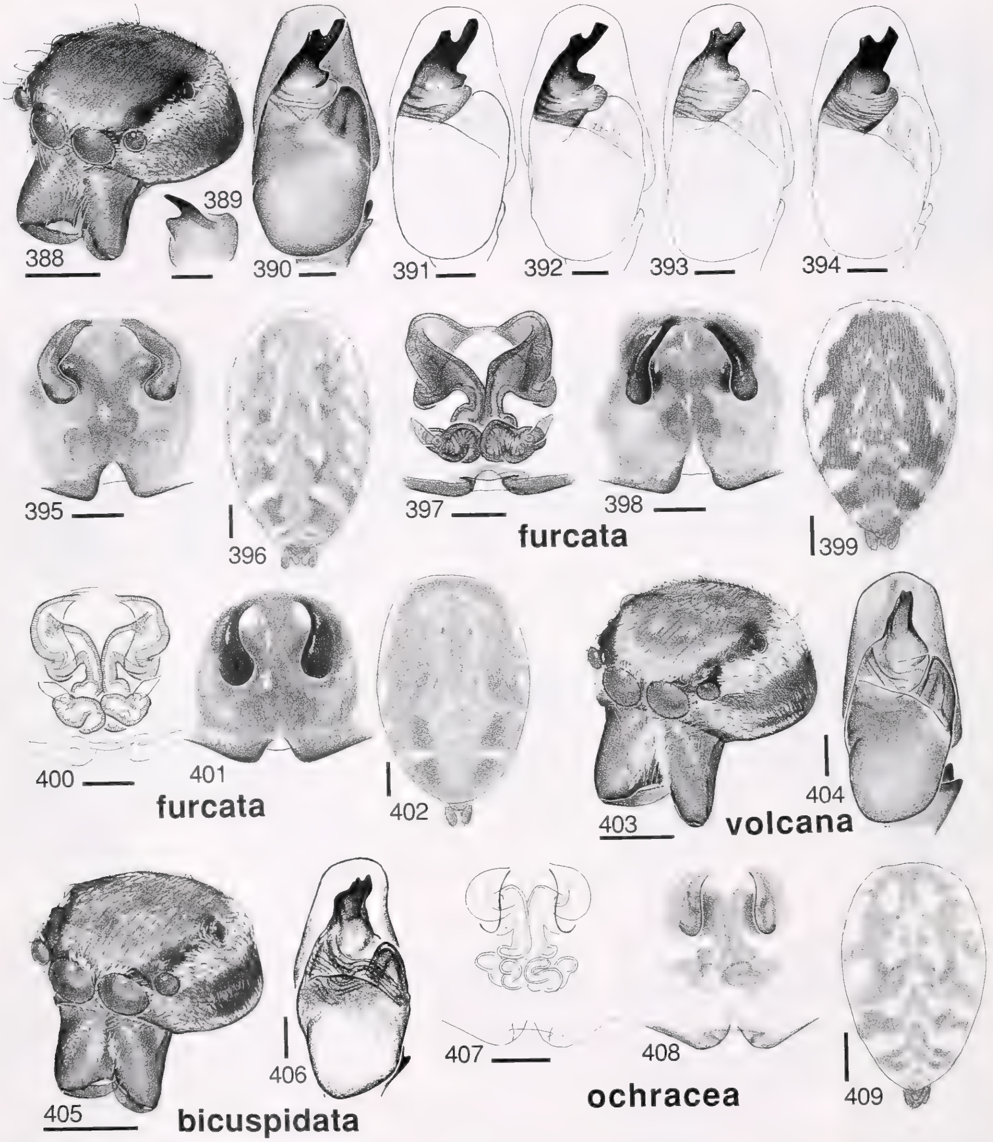
Figures 365–377. *Pelegrina aeneola* (sp. 19). 365. ♂ face (California: Ventura Co.). 366–372. Palpi (366, British Columbia: Fountain Valley; 367, California: Ventura co.; 368, 369, Oregon: Lake Co.; 370, 371 Idaho: Franklin Co.; 372 Wyoming: Sheridan Co.). 373, 374. Epigynum dorsal (373) and ventral (374) (British Columbia: Fountain Valley). 375, 376. Epigynum, dorsal (375) and ventral (376) (South Dakota: Custer Co.). 377. ♀ abdomen (South Dakota: Custer Co.).

Figures 378–382. *Pelegrina balia* (sp. 20; California: Santa Barbara Co., holotype and paratype). 378. ♂ face (arrow shows distinctive flange on fang). 379. Palp. 380. Epigynum, dorsal. 381. Epigynum, ventral. 382. ♀ abdomen.

Figures 383–387. *Pelegrina chalceola* (sp. 21). 383. ♂ face (holotype). 384. Palp (holotype). 385, 386. Epigynum, dorsal (385) and ventral (386) (Arizona: Chiricahua Mtns.). 387. ♀ abdomen (Arizona: Chiricahua Mtns.).

Scale bars. 0.1 mm, excpet for ♂ face and ♀ abdomen 0.5 mm.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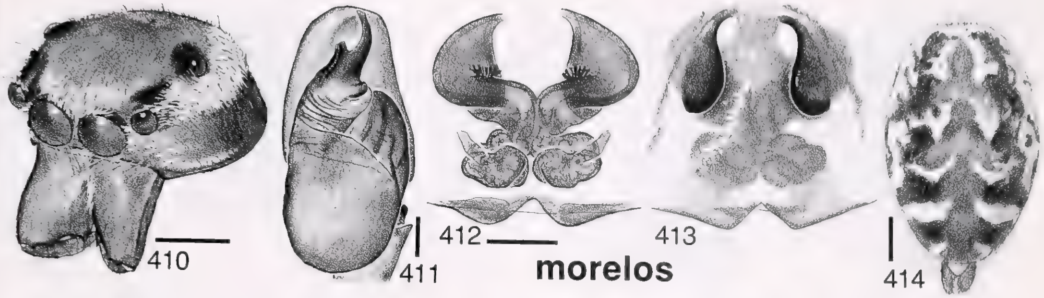
Figures 388–402. *Pelegrina furcata* (sp. 22). 388. ♂ face (Oaxaca: 31 km N of Guelatao de Jaurez). 389. Tibial apophysis (Puebla: nr. Xicotepec de Juarez). 390–394. Palpi (390, Colorado: El Paso Co.; 391, Arizona: Yavapai Co.; 392, Arizona: Santa Cruz Co.; 393, Guatemala; labeled "Type"; 394, Oaxaca: 31 km N of Guelatao de Juarez). 395, 396 (Arizona: Yavapai Co.). 395. Epigynum, ventral. 396. ♀ abdomen. 397–399 (Arizona: Santa Cruz Co.). 397. Epigynum, dorsal. 398. Epigynum, ventral. 399. ♀ abdomen. 400-402 (Oaxaca: 31 km N of Guelatao de Juarez). 400. Epigynum, dorsal. 401. Epigynum, ventral. 402. ♀ abdomen.

Figures 403, 404. *Pelegrina volcana* (sp. 23; Panamá: El Volcán). 403. ♂ face. 404. Palp.

Figures 405, 406. *Pelegrina bicuspidata* (sp. 24). 405. ♂ face (Chiapas: nr. Arriaga). 406. Right palp, image photographically reversed (holotype).

Figures 407–409. *Pelegrina ochracea* (sp. 25). 407, 408. Epigynum, ventral view after clearing (407) and before clearing (408) (holotype). 409. ♀ abdomen (Chiapas: San Cristóbal).

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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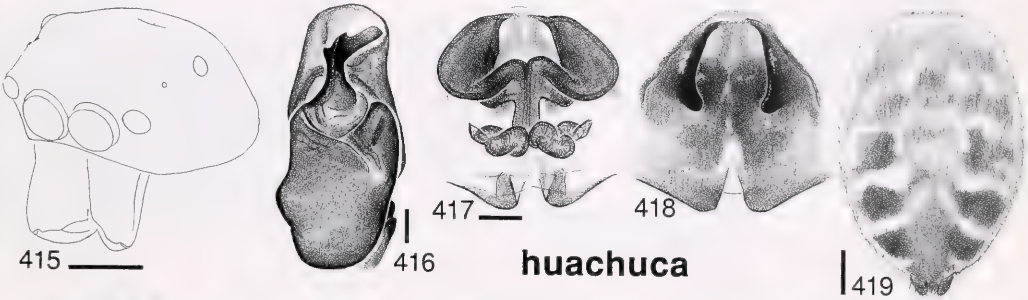
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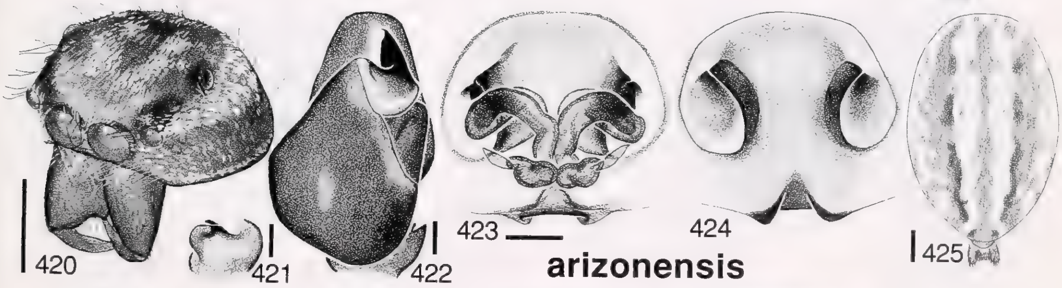
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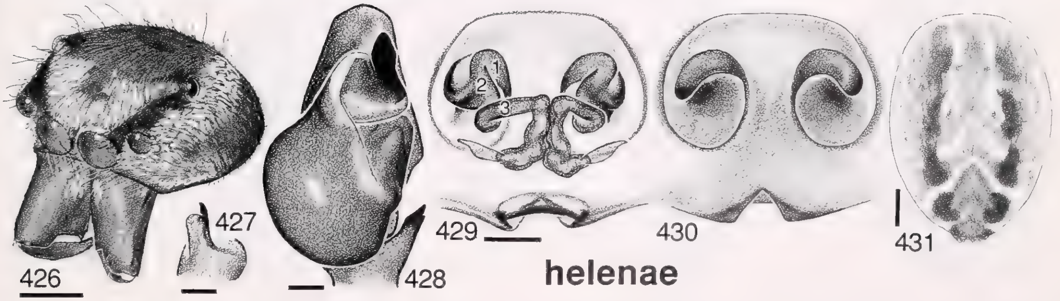
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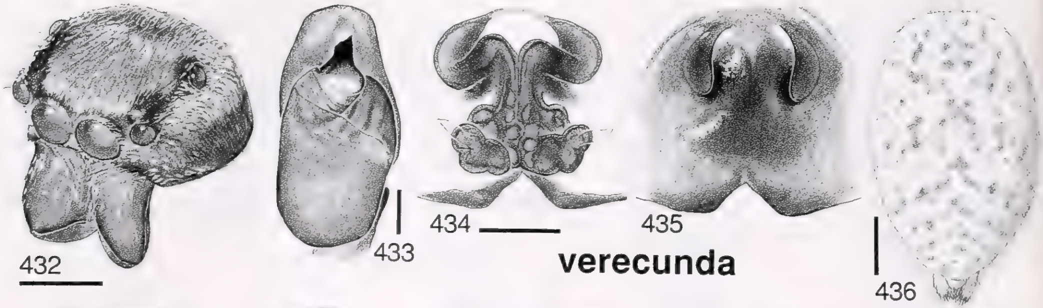
Figures 410–414. *Pelegrina morelos* (sp. 26; holotype and paratype). 410. ♂ face. 411. Palp. 412. Epigynum, dorsal. 413. Epigynum, ventral. 414. ♀ abdomen.

Figures 415–419. *Pelegrina huachuca* (sp. 27). 415. ♂ face (holotype). 416. Palp (holotype). 417, 418. Epigynum, dorsal (417) and ventral (418) (Arizona: Madera Canyon). 419. ♀ abdomen (Arizona: Santa Catalina Mtns.).

Figures 420–425. *Pelegrina arizonensis* (sp. 28; Minnesota: Anoka Co.). 420. ♂ face. 421. Tibial apophysis. 422. Palp. 423. Epigynum, dorsal. 424. Epigynum, ventral. 425. ♀ abdomen.

Figures 426–431. *Pelegrina helenae* (sp. 29). 426. ♂ face (Washington: Franklin Co.). 427–430 (Wyoming: Bighorn Co.). 427. Tibial apophysis. 428. Palp. 429. Epigynum, dorsal. 430. Epigynum, ventral. 431. ♀ abdomen (Nevada: Washoe Co.).

Scale bars. 0.1 mm, excpet for ♂ face and ♀ abdomen 0.5 mm.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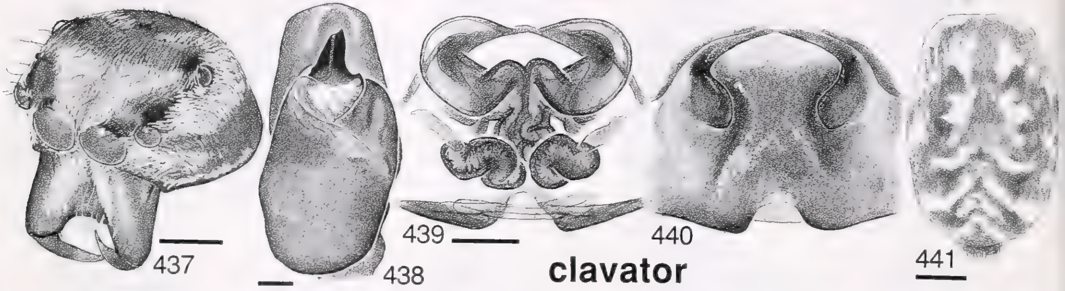
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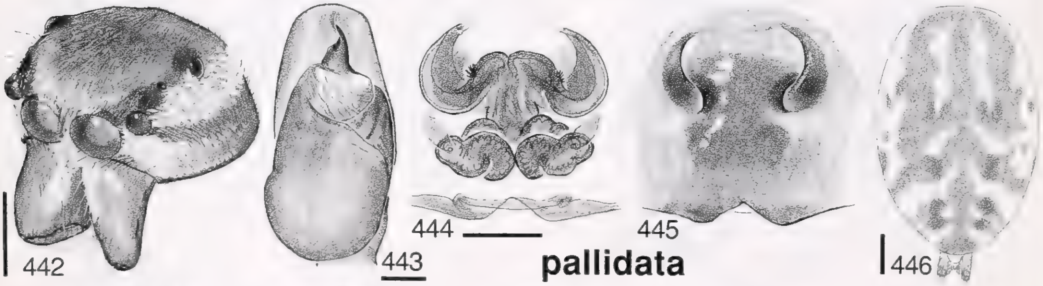
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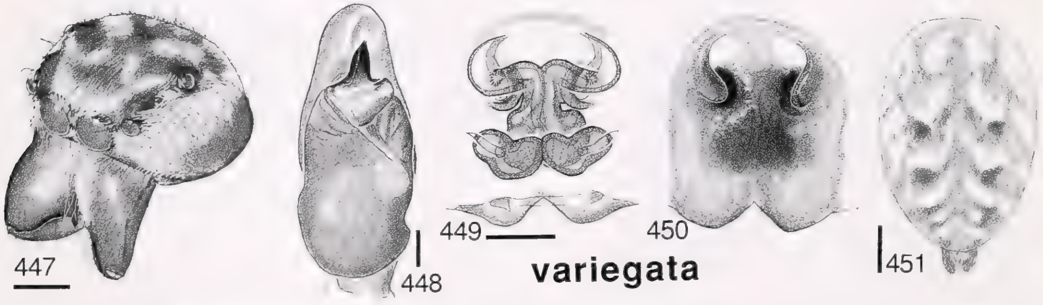
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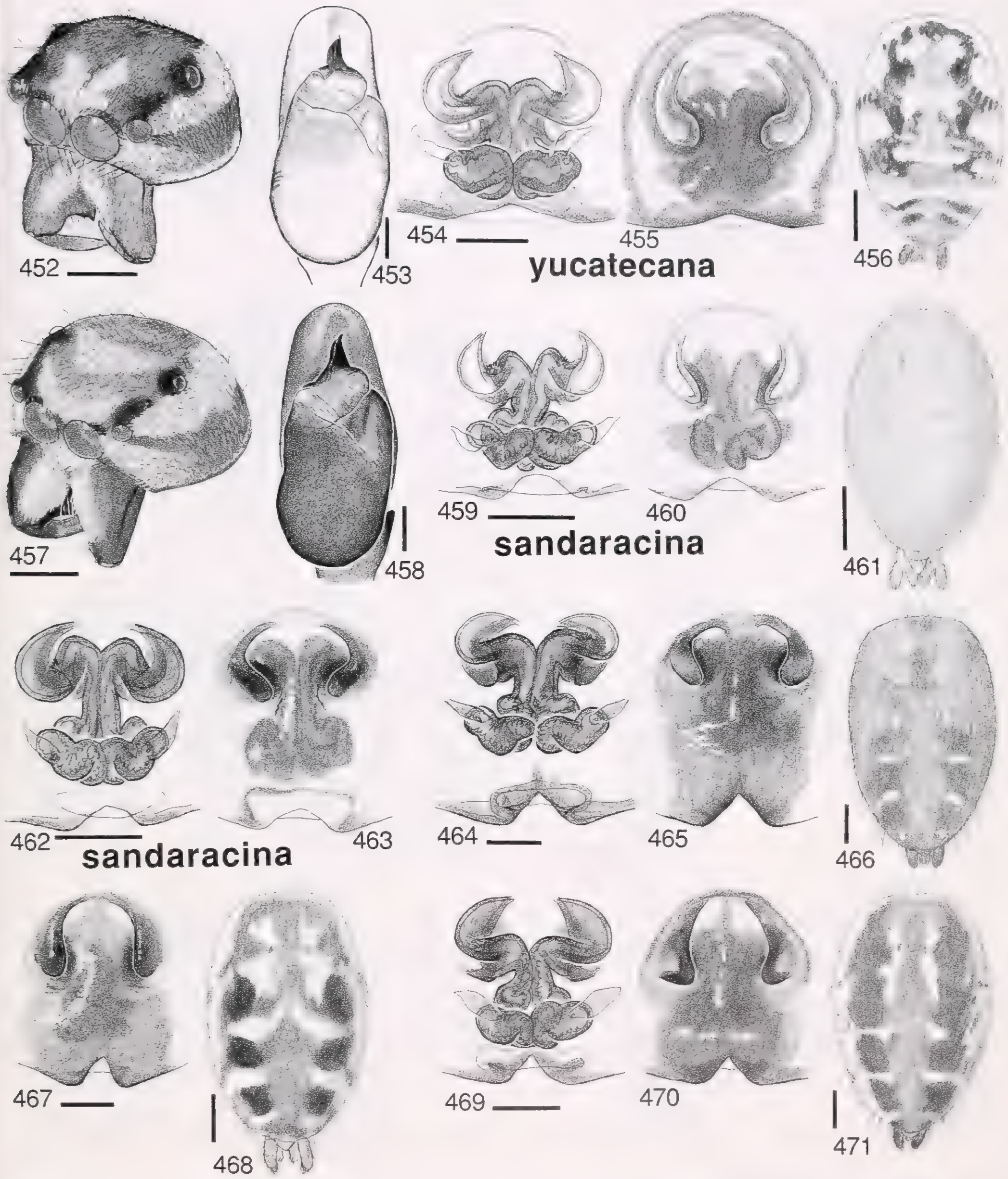
Figures 432–436. *Pelegrina verecunda* (sp. 30; Arizona: Yavapai Co., except 436 Arizona: Cochise Co.). 432. ♂ face. 433. Palp. 434. Epigynum, dorsal. 435. Epigynum, ventral. 436. ♀ abdomen.

Figures 437–441. *Pelegrina clavator* (sp. 31; Nuevo León: Chipinque Mesa). 437. ♂ face. 438. Palp. 439. Epigynum, dorsal. 440. Epigynum, ventral. 441. ♀ abdomen.

Figures 442–446. *Pelegrina pallidata* (sp. 32). 442. ♂ face (Nicaragua: Matagalpa). 443. Palp (Nicaragua: Matagalpa). 444, 445. Epigynum, dorsal (444) and ventral (445) (Guatemala: Chichicatenango). 446. ♀ abdomen (Chiapas: near San Cristóbal).

Figures 447–451. *Pelegrina variegata* (sp. 33; Oaxaca: nr. El Tule). 447. ♂ face. 448. Palp. 449. Epigynum, dorsal. 450. Epigynum, ventral. 451. ♀ abdomen.

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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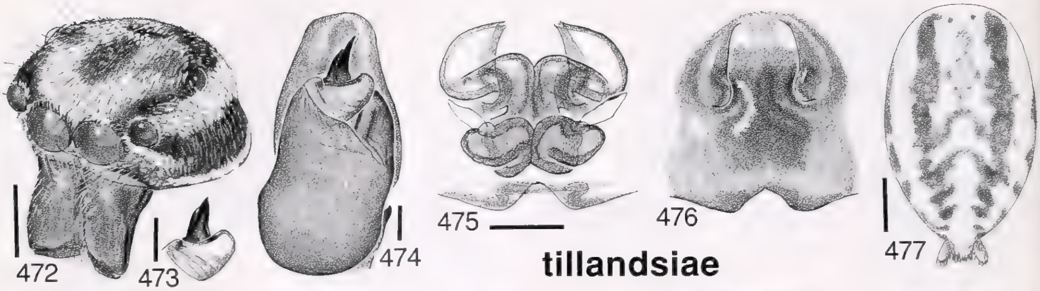
Figures 452–456. *Pelegrina yucatecana* (sp. 34). 452. ♂ face (holotype). 453. Palp (holotype). 454, 455. Epigynum, dorsal (454) and ventral (455) (Yucatán: nr. Xocenpich). 456. ♀ abdomen (Yucatán: nr. Chichen Itza).

Figures 457–463. *Pelegrina sandaracina* (sp. 35). 457. ♂ face (holotype). 458. Palp (holotype). 459–461 (Yucatán: Grutas de Loltun). 459. Epigynum, dorsal. 460. Epigynum, ventral. 461. ♀ abdomen. 462–463 (Chiapas: Arriaga). 462. Epigynum, dorsal. 463. Epigynum, ventral.

Figures 464–471. *Pelegrina* species. 464–466. From Neriaco, México. 464. Epigynum, dorsal. 465. Epigynum, ventral. 466. ♀ abdomen. 467, 468. From Jalisco and Guerrero. 467. Epigynum, ventral (Guerrero: 11 mi W of Chilpancingo). 468. ♀ abdomen (Jalisco: 3 mi S of Mazamitla). 469–471. From Durango (10 mi E of El Salto). 469. Epigynum, dorsal. 470. Epigynum, ventral. 471. ♀ abdomen.

Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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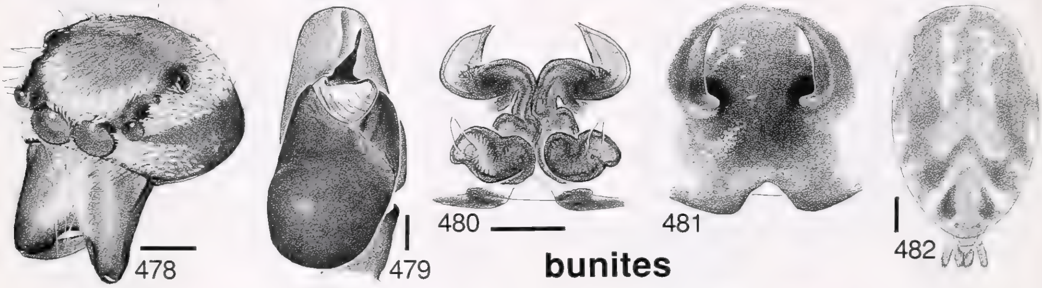
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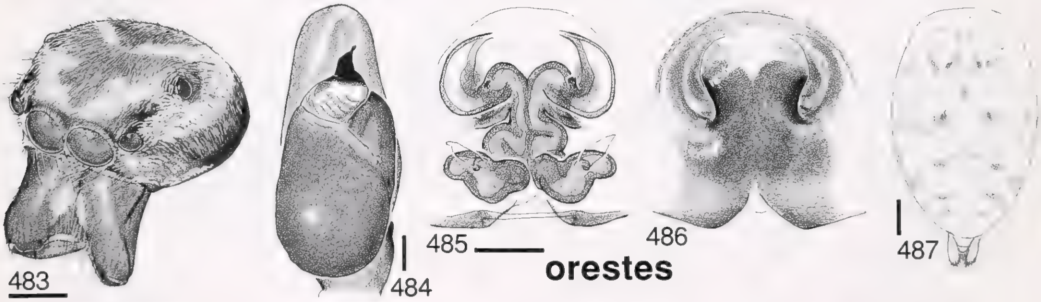
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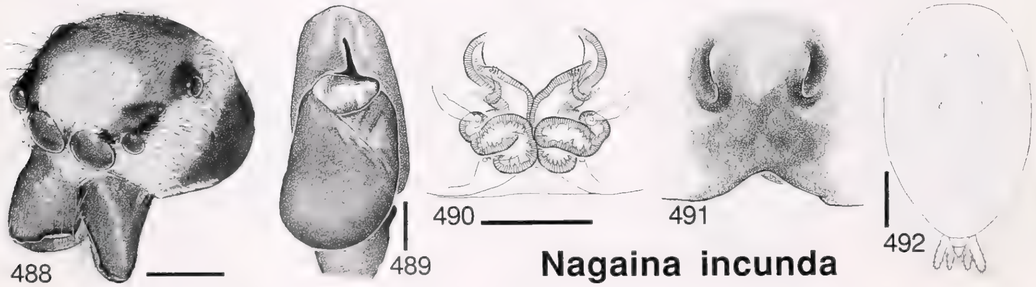
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Figures 472–477. *Pelegrina tillandsiae* (sp. 36). 472. ♂ face (North Carolina: Polluckville). 473. Embolus (Florida: Lake Placid). 474. Palp (Louisiana: Baton Rouge). 475, 476. Epigynum, dorsal (475) and ventral (476) (Louisiana: Baton Rouge). 477. ♀ abdomen (Florida: Lake Placid).

Figures 478–482. *Pelegrina bunites* (sp. 37; Oaxaca: 50 km NW of Oaxaca, except 478 Arizona: Santa Cruz Co.). 478. ♂ face. 479. Palp. 480. Epigynum, dorsal. 481. Epigynum, ventral. 482. ♀ abdomen.

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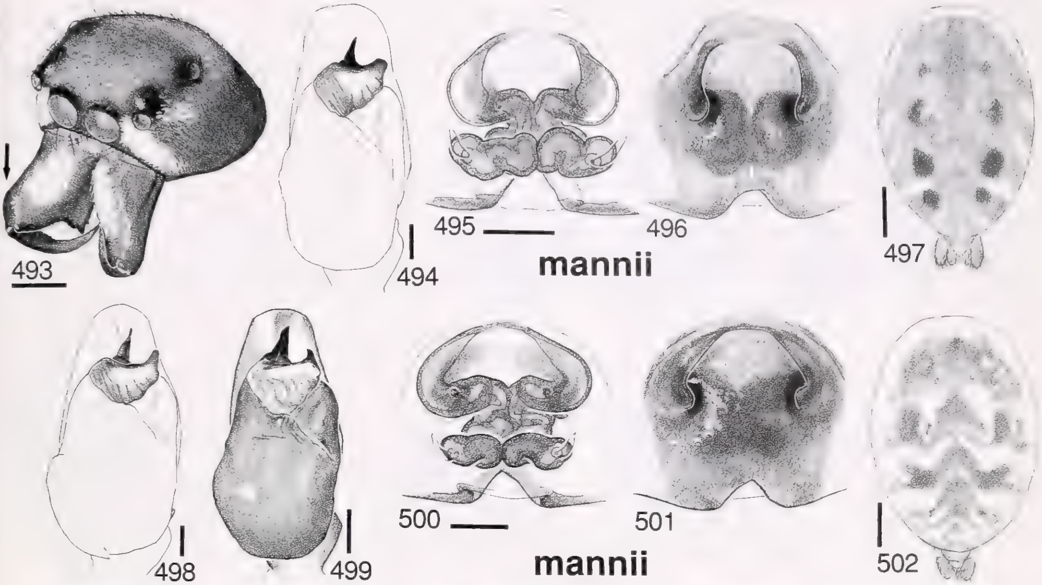
Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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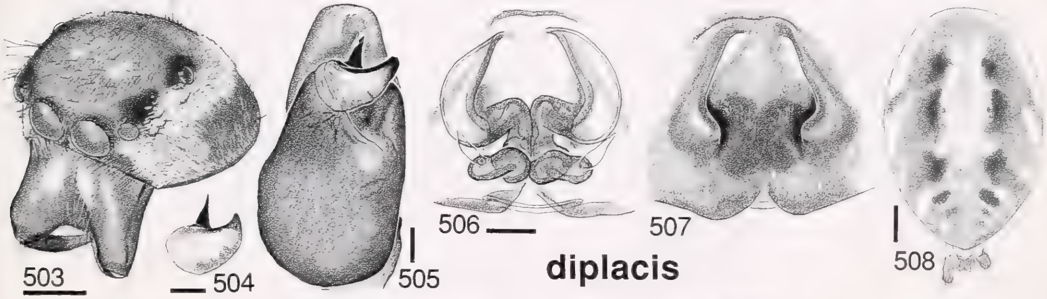
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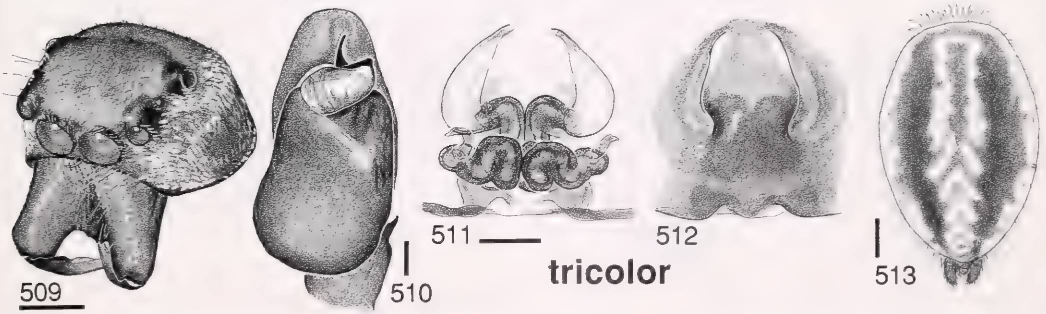
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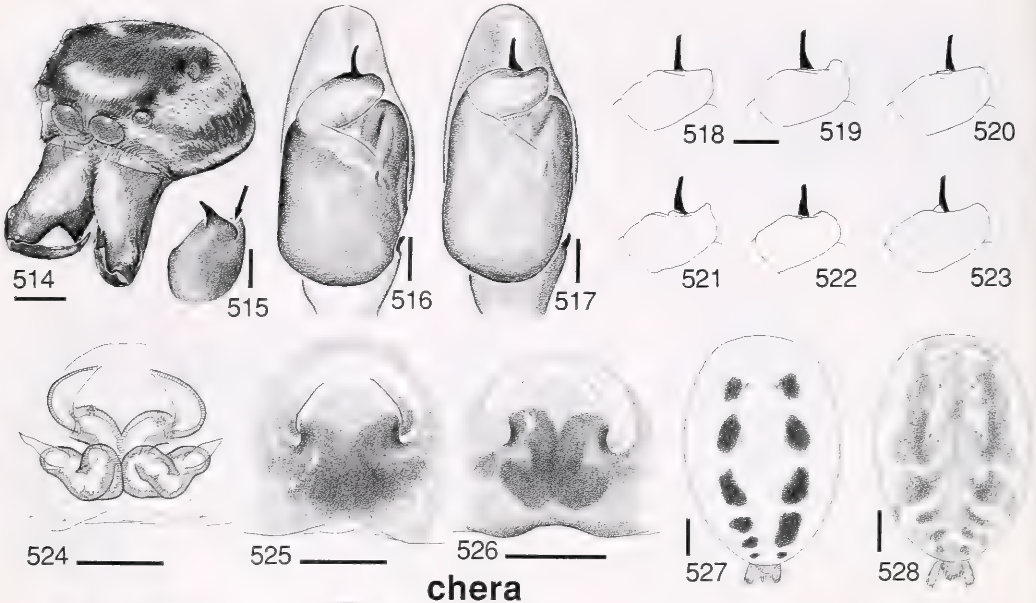
Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.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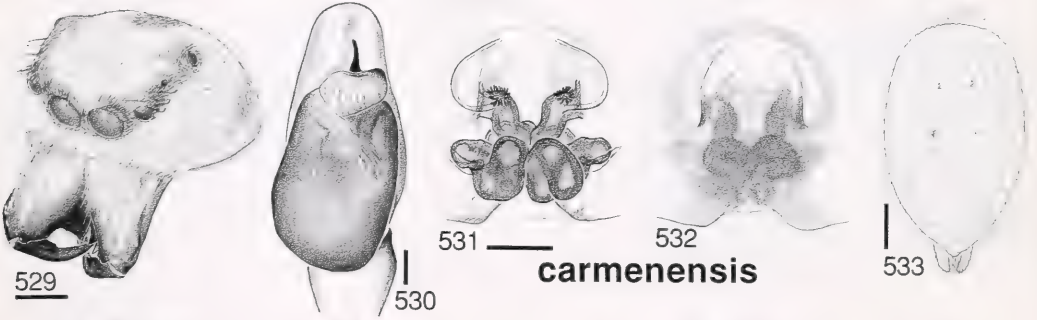
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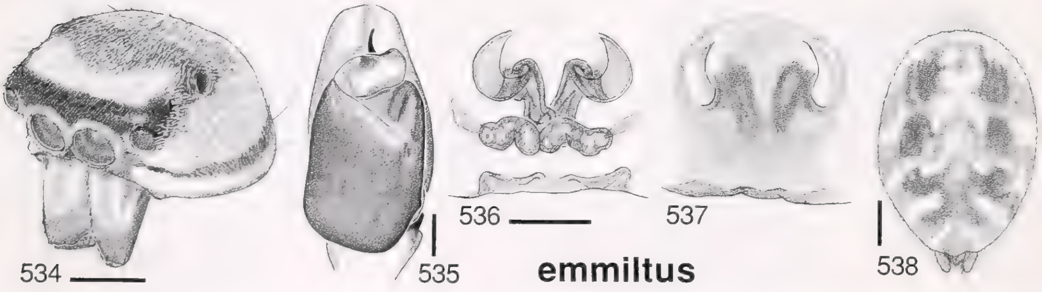
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Scale bars. 0.1 mm, except for ♂ face and ♀ abdomen 0.5 mm.

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Snakes of the Genus *Liopholidophis* (Colubridae) from Eastern Madagascar: New Species, Revisionary Notes, and an Estimate of Phylogeny

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SNAKES OF THE GENUS *LIOPHOLIDOPHIS* (COLUBRIDAE) FROM EASTERN MADAGASCAR: NEW SPECIES, REVISIONARY NOTES, AND AN ESTIMATE OF PHYLOGENY

JOHN E. CADLE[1]

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ABSTRACT. Two new species of the Madagascan snake genus *Liopholidophis* are described, and the genus is partially revised to clarify the status of species occurring in the Ranomafana National Park (RNP), eastern Madagascar. Nine species of *Liopholidophis* are recognized herein; with the exceptions of *L. pinguis* Parker and *L. stumpffi* (Boettger), all are known from the RNP. These are *rhadinaea,* new species, *epistibes,* new species, *dolicocercus* (Peracca), *grandidieri* Mocquard, *infrasignatus* (Günther), *lateralis* (Duméril, Bibron, and Duméril), *pinguis* Parker, *sexlineatus* (Günther), and *stumpffi* (Boettger). *Dromicus dolicocercus* Peracca is here resurrected from the synonymy of *L. sexlineatus. Ptyas infrasignatus* Günther is resurrected from the synonymy of *lateralis* and recognized as a senior synonym of *Liopholidophis thieli* Domergue of recent authors. *Liopholidophis stumpffi* (Boettger) (type locality, Nosy-Be) appears to be restricted to northern Madagascar, at least the island of Nosy-Be and the vicinity of Montagne d'Ambre. But the name *stumpffi* has recently been misapplied to a wide-ranging species of the eastern rainforests that is also known from northern Madagascar in the vicinities of Mahajanga and Montagne d'Ambre. This previously unnamed species is the one described herein as *L. epistibes,* new species. *Liopholidophis rhadinaea,* new species, is known from the RNP and from near the Perinet (Andasibe) reserve.

A key to the species is presented. Two species groups earlier recognized by Parker (1925)—the *sexlineatus* group and the *stumpffi* group—are retained, and evidence supporting the monophyly of each is summarized. The *sexlineatus* group includes the species *sexlineatus, dolicocercus, grandidieri, pinguis,* and *rhadinaea,* new species. The *stumpffi* group includes *stumpffi, lateralis, infrasignatus,* and *epistibes,* new species. Hemipenes of all species are bilobed, noncapitate, and acalyculate (entirely spinose), with deeply bifurcate centrolineal sulci spermatici. Otherwise, details of hemipenial morphology differ substantially between the species groups. Peculiar apical structures are present in *dolicocercus, rhadinaea,* and *sexlineatus,* but hemipenes of the *sexlineatus* group in general are rather dissimilar. Hemipenes of species

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in the *stumpffi* group are all characterized by an unusual "umbelliform" depression at the tips of the lobes.

The *sexlineatus* group is characterized (among other features) by two characters that are highly unusual for colubrids: (1) extraordinary sexual dimorphism in tail length (except in the plesiomorphic species, *pinguis,* in which the dimorphism is reduced, tails of males average >40% of total length [≥13% difference between means of proportional tail length of the two sexes]), and (2) male superiority in body size and ventral counts. The first character is unknown in snakes outside the *L. sexlineatus* group. In contrast, the *stumpffi* group lacks these unusual features. A phylogenetic hypothesis supported by characters of external morphology, hemipenes, skulls, and behavior suggests the following relationships: ((((*dolicocercus, grandidieri*), *rhadinaea* new species), *sexlineatus*), *pinguis*); and ((*stumpffi, epistibes* new species), *infrasignatus, lateralis*).

Although the species groups of *Liopholidophis* appear to be monophyletic, no strong evidence supports the monophyly of *Liopholidophis sensu lato.* However, revision of the generic concept is not warranted until broader relationships among Malagasy colubrids are better understood. Problems concerning the generic status are highlighted by similarities among *Liopholidophis rhadinaea,* new species, several species in the genus *Liophidium,* and a specimen resembling *L. rhadinaea,* new species, in external and hemipenial characters, but whose generic and species placement is enigmatic.

Species of *Liopholidophis* are diurnal and terrestrial, except for *sexlineatus,* which is semiaquatic (no observations for *pinguis* and *stumpffi*). Species of *Liopholidophis* consume primarily frogs (one chamaeleon record; no data for *pinguis, grandidieri,* and *stumpffi*). Most dietary items for *infrasignatus, epistibes,* new species, and *dolicocercus* were terrestrial microhylid frogs (*Plethodontohyla* spp.); two records for *rhadinaea,* new species, were clutches of frog eggs; *sexlineatus* consumed *Heterixalus* (Hyperoliidae) and *Ptychadena* (Ranidae); *lateralis* consumed *Mantidactylus* and *Ptychadena* (Ranidae), and *Boophis* (Rhacophoridae). Species of *Liopholidophis* are probably oviparous with the exception of *sexlineatus,* which appears to be viviparous (data somewhat equivocal for *dolicocercus*; no data for *stumpffi* and *pinguis*).

INTRODUCTION

The Madagascan snake genus *Liopholidophis* (Colubridae) as presently defined (Mocquard, 1904; Guibé, 1958) includes rather generalized terrestrial to semiaquatic snakes. Several nominal species, including *grandidieri* Mocquard, *dolicocercus* Peracca, *sexlineatus* Günther, and a new species described herein, exhibit the unusual characteristic of considerable sexual dimorphism in tail length, a character used by Mocquard (1904) in defining the genus. In these species the tail of males averages >40% of total length, whereas in females the tail is usually <30% of total length (>50% and 35% for males and females, respectively, in *grandidieri*) (see additional comments herein). In other colubrids, including other species of *Liopholidophis,* the tails of males and females do not show such exaggerated differences in length, and the sexes overlap in the relative proportion of tail to total length. The monophyly of *Liopholidophis sensu lato* has never been explicitly justified and will be considered in detail later in this paper.

Most nominal taxa of *Liopholidophis* were described in the first half-decade of the twentieth century or earlier. Their nomenclatural history is summarized in the species accounts. Present understanding of *Liopholidophis* stems primarily from the generic summaries of Parker (1925), Guibé (1954, 1958), and Domergue (1969, 1973). Parker (1925) described a new species (*pinguis*) and informally recognized two species groups within *Liopholidophis*: a "*sexlineatus* group" including *grandidieri, dolicocercus,* and *sexlineatus,* based on the shared characters of extreme sexual dimorphism in tail length and 17 midbody scale rows; and a "*stumpffi* group," including *lateralis* and *stumpffi,* which lack the extreme tail dimorphism and have 19 midbody scale rows. Parker left *pinguis,* which shares 17 midbody scale rows with the *sexlineatus* group but has reduced sexual dimorphism in tail length, unplaced in either group. Subsequently, Guibé (1958) synonymized *dolicocercus* with *sexlineatus,* and *stumpffi* was first synonymized with *lateralis* (Guibé, 1954), and then resurrected (Domergue, 1973). Domergue (1973) described a new species, *thieli,* and also (Domergue, 1969) recognized that *L. pseudolateralis* Guibé (1954) was a synonym of *Dromicodryas bernieri* (Duméril, Bibron, and Duméril, 1854). These changes have resulted in the presently recognized species of *Liopholidophis*: *grandidieri*

Mocquard (1904), *sexlineatus* (Günther, 1882), *pinguis* Parker (1925), *lateralis* (Duméril, Bibron, and Duméril, 1854),[2] *stumpffi* (Boettger, 1881a,b), and *thieli* Domergue (1973) (e.g., Glaw and Vences, 1994). At least one undescribed species from northern Madagascar is known (Raxworthy and Nussbaum, 1994a).

A general herpetological survey of the recently established Ranomafana National Park in eastern Madagascar (hereafter, RNP; Fianarantsoa Province, Ifanadiana fivondronana; Fig. 3) has resulted in discovery of a number of new species of amphibians and reptiles (e.g., Cadle, 1995). The primary aim of this paper is to clarify the status of species of *Liopholidophis* from the RNP. In doing so, I describe two new species, resurrect two old names from synonymy, and summarize data for the other species. A full-scale revision of *Liopholidophis* is beyond the scope of this report, but I have undertaken revisionary steps pertinent to the nomenclature of species occurring in the RNP, which includes all species recognized herein except *pinguis* and *stumpffi* (Boettger) (see later). Some questions concerning species limits within *Liopholidophis*, especially in the broadly distributed species *lateralis* and *sexlineatus*, clearly need to be examined anew with more detailed geographic comparisons than undertaken here.

I summarize knowledge of all species, present illustrations (except *stumpffi* and *pinguis*) and descriptions of hemipenes of all species, and hypothesize relationships within the species groups based on external morphology, color patterns, hemipenes, skull morphology, and behavior. Revised synonymies are given for all species. Nomenclaturally relevant actions taken herein include the following. (1) *Dromicus dolicocercus* Peracca (1892) is resurrected from the synonymy of *Liopholidophis sexlineatus* (Günther), where it was placed by Guibé (1958). (2) A lectotype is designated for *Dromicus stumpffi* Boettger, a species known only from northern Madagascar (at least Nossi-bé, the type locality, and the vicinity of Montagne d'Ambre); a wide-ranging species of the eastern forests previously confused with *stumpffi sensu* Boettger is described as new. (3) A lectotype is designated for *Ptyas infrasignatus* Günther (1882), and that name is recognized as a senior synonym of *Liopholidophis thieli* Domergue (1973), as used widely in current literature (e.g., Glaw and Vences, 1994).

MATERIALS AND METHODS

My study of *Liopholidophis* is based primarily on specimens resulting from a herpetofaunal survey of the RNP. In reviewing the species of the RNP, I incorporate data from other specimens (Appendix) and from the literature as necessary. I have not attempted a comprehensive survey of museum specimens or a thorough study of geographic variation in any species, although I comment where appropriate on apparent geographic patterns. I have probably seen most known specimens of *dolicocercus*, *grandidieri*, *pinguis*, and *rhadinaea*, new species.

Distributional summaries are based on specimens examined (Appendix), Domergue (1973), and Parker (1925). However, I have not verified the identity of specimens at the limits of the ranges for the widespread species *epistibes*, new species, *lateralis*, and *infrasignatus*; the literature and localities documenting those limits are cited in the species accounts. Most natural history observations are from the RNP region, although for the widespread species *L. sexlineatus* and *L. lateralis*, I have included observations from other localities. Such instances are identified in the text. Comments on general macrohabitats of prey items (e.g., "arboreal") are from personal observations and, unless otherwise stated, are from the RNP and of active animals; of course, the snakes could likely have captured inactive prey, whose retreat sites are less well known.

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[2] Virtually all authors, apparently beginning with Jan (1863) and Boulenger (1893), have cited authorship of this name as "Duméril and Bibron," but the species is described in volume 7 of the Érpetologie Générale, authored by Duméril, Bibron, and Duméril.

For convenience I refer to the two species groups erected by Parker (1925), modified to reflect my view of their composition, as follows: (a) the *sexlineatus* group: *sexlineatus, dolicocercus, grandidieri, pinguis,* and *rhadinaea,* new species; and (b) the *stumpffi* group: *stumpffi, infrasignatus, lateralis,* and *epistibes,* new species. Additional justification for these groups is given later (see "Monophyly of the Species Groups of *Liopholidophis*").

Hemipenial terminology follows Myers (1973, 1974), Myers and Campbell (1981), and Myers and Cadle (1994). All everted organs were inflated with colored jelly to enhance the surface ornamentation prior to description. In several cases identified below I used a modification of the method of Pesantes (1994) for preparing everted organs from hemipenes originally preserved partially or wholly inverted. However, rather than neutralization of the potassium hydroxide (KOH) treatment with hydrochloric acid, as in Pesantes (1994), I exhaustively soaked the organs in several changes of water followed by several changes of alcohol. This was to avoid possible damage to calcified structures by the acid treatment. The method works well, although it is easy to puncture small, delicate organs. However, as a cautionary note, hemipenes everted in this way may not assume precisely the same form as organs everted from fresh specimens unless the KOH treatment is sufficient to assure complete expansion of the soft tissue (see description of *Liopholidophis stumpffi* hemipenis, later). In my limited experience, the method works better for larger organs than for smaller ones, which are inherently more delicate (hence, I tended to be conservative in application of the KOH treatment). Descriptions of hemipenial morphology and skull osteology are relegated to comprehensive sections apart from species accounts.

Inferences of reproductive mode were confirmed, where possible, according to criteria and terminology outlined by Blackburn (1993, 1994). Museum abbreviations used in the text are given at the beginning of the Appendix. Translations from French and Italian are my own; Malagasy names for snakes are translated when their meaning seems evident.

Coordinates for localities are given in the text where pertinent and for all localizable localities in the Appendix. Unless otherwise stated, coordinates were derived from three principal sources: (1) for localities in the vicinity of the RNP, the series of 1:50,000 maps published by the Foiben-Taosarintanin'i Madagasikara, Antananarivo (FTM); (2) a series of four 1:1,000,000 maps of Madagascar, also published by the FTM; and (3) the Defense Mapping Agency (1989) gazetteer. Specific localities within the RNP are mapped in Cadle (1995). A useful discussion of some historical Malagasy collections and localities is given by Carleton and Schmidt (1990), and Glaw and Vences (1994:appendix 7) give an abbreviated list of herpetological localities.

Malagasy place names are notoriously redundant and highly variable in their spellings (e.g., Nossi-bé, Nosy Be, and Nosibé for the island properly referred to as Nosy Be ["Big Island"]). Most names of the colonial period are now reverting to their traditional ones (e.g., Diego Suarez = Antsiranana; Tamatave = Toamasina). In quoting localities from original sources (e.g., publications, museum catalogs), I use the spelling variants in those sources but give a modern equivalent at least upon the first use; localities are heavily annotated in the Appendix to facilitate cross-referencing.

DESCRIPTIONS OF TWO NEW SPECIES

The first new species to be described is a member of the genus *Liopholidophis* Mocquard (1904:302–304) by virtue of having strong sexual dimorphism in tail length (>35% of total length in males, <30% in females), 17 midbody scale rows (reducing to 15 posteriorly), hypapophyses present on posterior trunk vertebrae, maxillary teeth 23–28 + 2 ungrooved fangs,

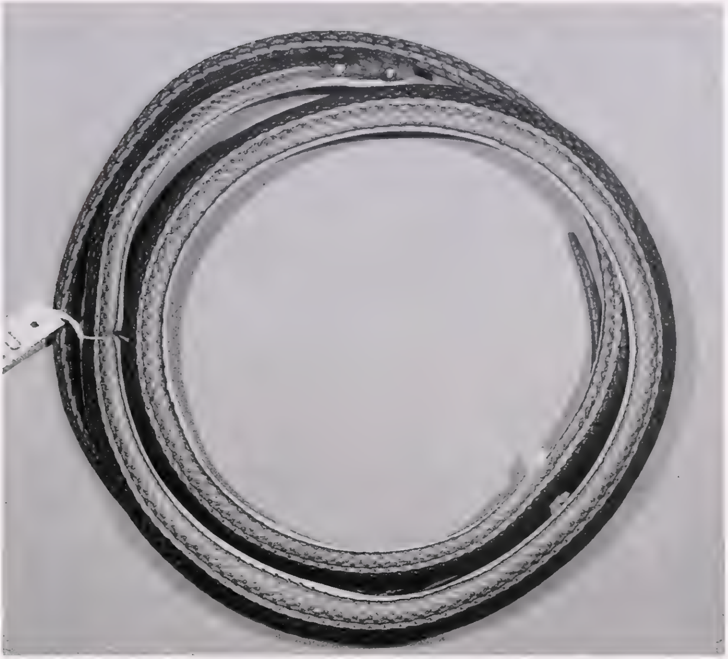

Figure 1. *Liopholidophis rhadinaea*, holotype (MCZ 180395, male). Approximately ×0.9.

smooth scales without apical pits, deeply bilobed hemipenis ornamented with spines, and a deeply bifurcate centrolineal sulcus spermaticus. The relative tail lengths in the two sexes, in combination with having 17 midbody scale rows, ally the new species to the *sexlineatus* group of *Liopholidophis* (Parker, 1925). However, as suggested later (see "Monophyly of *Liopholidophis*"), little evidence supports the monophyly of *Liopholidophis* broadly conceived, and future reevaluation of the status of all included species is warranted.

Liopholidophis rhadinaea, new species

Figures 1–2, 4–5

Liophidium sp.: Domergue (1988:144, specimen 2).

Holotype. **Museum of Comparative Zoology (MCZ) 180395** (field number JEC 11466), an adult male in good condition (Figs. 1–2) from Talatakely, Ranomafana National Park, 950–1,000 m, Fivondronana Ifanadiana, Fianarantsoa Province, Madagascar [21°16′S, 47°25′E]. Specimen obtained by John E. Cadle 20–26 December 1991.

Paratypes. Eighteen specimens, 17 in the Museum of Comparative Zoology obtained by J. E. Cadle, one in the Museum National d'Histoire Naturelle, Paris (MNHN). All specimens in the MCZ are paratopotypes; data for the MNHN specimen are given below: **MCZ 180385** (field number JE Cadle 9644), adult female, 26 October 1990; **MCZ 180386** (JEC 9649), adult female, 24 October 1990; **MCZ 180387** (JEC 9932), hatchling female,[3] 19 November 1990; **MCZ 180388** (JEC 9933), subadult female, 19 November 1990; **MCZ 180389** (JEC 10087), adult male, 25–28 November 1990; **MCZ 180390** (JEC 10115), adult male, 4 December 1990; **MCZ 180391** (JEC 10152), adult female, 9 December 1990; **MCZ 180392** (JEC 10610),

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[3] Specimens ≤135 mm SVL were considered hatchlings.

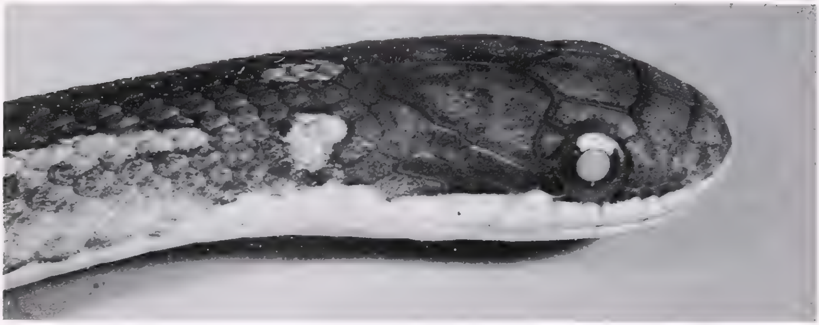

Figure 2. *Liopholidophis rhadinaea*, head of MCZ 180395 (holotype). Approximately ×5.

adult male, 15 November 1990; **MCZ 180393** (JEC 11180), adult female, fluid + cleared and stained skull, 17 December 1991; **MCZ 180394** (JEC 11223), adult male, 18 December 1991; **MCZ 180396** (JEC 11564), adult male, 2 January 1992; **MCZ 180397** (JEC 11575), adult female, 3 January 1992; **MCZ 180398** (JEC 11576), hatchling female, 3 January 1992; **MCZ 180399** (JEC 11891), adult female, 11 December 1992; **MCZ 180400** (JEC 12344), adult female, 1 January 1993; **MCZ 180401** (JEC 12385), adult female, 5 January 1993; **MCZ 180402** (JEC 12388), adult male, 5 January 1993.

MNHN 1988-333 (field number 717/S), collected 14 January 1966 by M[ichel] Vincke[4] "north of Bevatraka, and 22 km north of the terminus of the Perinet forestry railroad" [Toamasina Province, Fivondronana Moramanga] (data translated from field tag attached to specimen). Perinet (=Andasibe) is at about 900 m on the eastern escarpment [18°56′S, 48°25′E]. This specimen was discussed as *Liophidium* sp. by Domergue (1988:144, specimen 2), who gave the identical locality except that the initial phrase was reported as "forêt de *Bevotaka*." I have been unable to locate either *Bevotaka* or *Bevatraka* in gazetteers or on maps, although Perinet itself is well known. Domergue (1988) erroneously reported the midbody dorsal scale count for this specimen as 15, rather than the 17 that it has.

Distribution. Known only from the type locality, Talatakely, within the RNP (21°16′S, 47°25′E), and from near "Bevatraka," 22 km N of Perinet (=Andasibe; 18°56′S, 48°25′E) (Fig. 3). The known elevational range is approximately 950–1,100 m at the type locality.

Etymology. The specific epithet is a noun in apposition referring to the Neotropical snake genus *Rhadinaea,* many species of which are strikingly similar to *Liopholidophis rhadinaea* in habitus, coloration, pattern, and montane forest habitat. The name also alludes to the characteristic slenderness of both *L. rhadinaea* and species of *Rhadinaea* (from the Greek proper name *Rhadine,* itself derived from *rhadinos* [=slender, lithe; see Myers, 1974: 16, 19]).

Diagnosis. Liopholidophis rhadinaea differs from all other members of the genus by the following combination of features: dorsal scales in 17–17–15 rows; tail 37–43% of total length in males, 24–27% in females; small size and slender habitus (largest known male 749 mm total length, largest known female 424 mm total length); ventrals 170–179 in males, 150–160 in females; subcaudals 126–135 in males, 69–77 in females; usually 8 upper labials (but high frequency of 7); 8 or 9 lower labials; and pattern consisting of three light yel-

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[4] Listed as "M. Vincke" on the field tag, this is assumed to be the Michel Vincke who collected the type of *Geodipsas vinckei,* as reported by Domergue (1988:140).

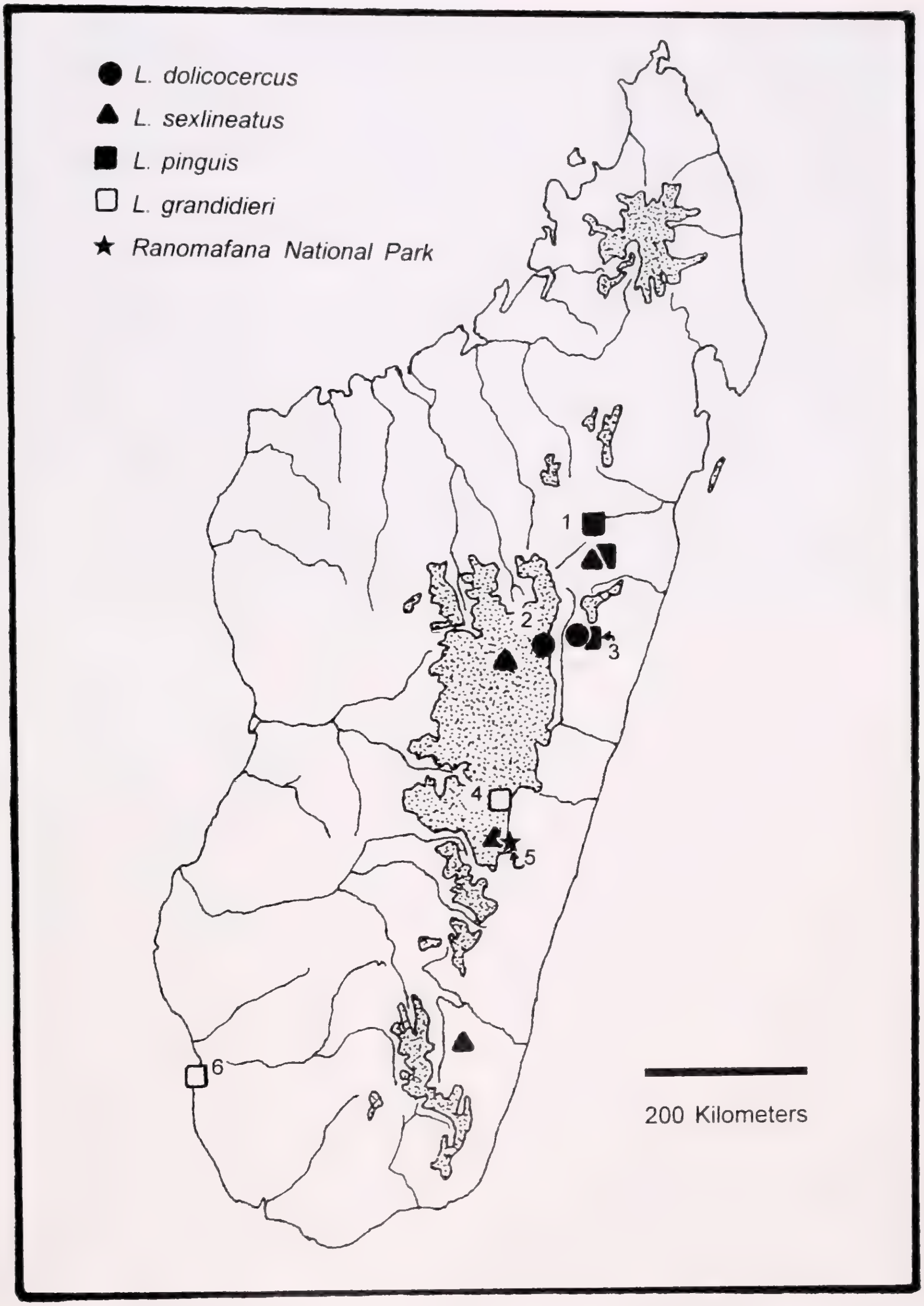
● *L. dolicocercus*
▲ *L. sexlineatus*
■ *L. pinguis*
☐ *L. grandidieri*
★ *Ranomafana National Park*
1
2
3
4
5
6
200 Kilometers

Figure 3. Distribution of species of the *Liopholidophis sexlineatus* group; shaded areas are above 1,000 m. All species indicated except *pinguis* are known from the RNP (locality 5). *Liopholidophis rhadinaea*, new species, is known from localities 5 (type locality) and 3. All known localities for species other than *sexlineatus* are indicated (see text for known distribution, and Glaw and Vences [1994:338] for a more comprehensive map of *sexlineatus* localities). Localities referred to in the text and Appendix are numbered as follows: (1) "Antsihanaka," type locality for *L. pinguis* Parker; (2) Andrangoloaka, type locality for *L. dolicocercus* (Peracca); (3) Perinet [Andasibe]; (4) Ambohimitombo; (5) RNP; and (6) Saint Augustine Bay, type locality [in error] for *L. grandidieri* Mocquard.

lowish brown nape spots (Fig. 2), broad dark brown stripe occupying middorsal 3 to 5 scale rows, narrow light yellowish brown dorsolateral stripes centered on scale rows 6 (anteriorly) or 5 (posteriorly), dark brown line on dorsal row 1, and light venter (pink to vermilion in life) (see Figs. 1, 4, 5).

Liopholidophis rhadinaea differs from species of the *stumpffi* group in having 17–17–15 scale rows and strong sexual dimorphism in tail length (19–19–17 scale rows and no strong dimorphism in tail length in the *stumpffi* group).

Four previously described valid nominal species of *Liopholidophis* (*dolicocercus, grandidieri, pinguis, sexlineatus*; cf. Table 1) have 17–17–15 rows, but all are larger and more robust than *L. rhadinaea*. *Liopholidophis dolicocercus* (to 928 mm total length in males, 992 mm in females) has fewer ventrals in both sexes (156–157 in males, 143–150 in females) and more subcaudals in males (140–164), has a distinctively patterned black venter bordered laterally with white stripes, and lacks discrete stripes on the dorsum. *Liopholidophis grandidieri* (to 1,636 mm total length in males, 674 mm in females) has a black venter, lacks distinct middorsal dark and dorsolateral light stripes (yellowish brown to yellow middorsal area heavily suffused with black or dark brown; lateral dark stripe on rows 2 + 3), and has a longer tail with more subcaudals in both sexes (tail >50% of total length and >200 subcaudals in two males; 35% of total length and 98^+–113 subcaudals in two females). *Liopholidophis pinguis* (to 890 mm total length in males, 685 mm in females) has an olive dorsal ground color with dark stripes (sometimes indistinct) and lacks light nape spots; males of *pinguis* have fewer ventrals (151–154), a shorter tail (33% of total length), and fewer subcaudals (91–98) than males of *rhadinaea*. *Liopholidophis sexlineatus* (to 1,338 mm total length in males, 726 mm in females) differs from *L. rhadinaea* in having fewer ventrals (148–163 in males, 139–148 in females), having an olive dorsal ground color with black stripes, lacking light nape spots, and having a whitish belly that may be heavily suffused or mottled with black.

Liophidium rhodogaster is sympatric with *Liopholidophis rhadinaea* at the two known localities for the latter and is very similar in overall appearance, including dorsal pattern and (in life) pink venter (this resemblance was noted by Domergue [1988] in discussing MNHN 1988-333, which he considered an undescribed species of *Liophidium*; cf. Figs. 1 and 5 with Glaw and Vences [1994:pl. 339]). *Liophidium rhodogaster* differs from *Liopholidophis rhadinaea* in lacking dorsal scale row reductions (17–17–17), having more ventrals (184–212 in the RNP), lacking extreme sexual dimorphism in relative tail length, and having a shorter tail in general (18–23% of total length, sexes combined). Additional comparisons of *rhadinaea* with *Liophidium* are given later (Discussion).

Data on the Holotype (MCZ 180395). The holotype is an adult male with everted hemipenes. Total length 720 mm; tail length 308 mm (43% of total length). Greatest head width (parietal region) 5.85 mm, head length 11.4 mm from tip of snout to end of mandibles. Dorsals 17–17–15, the reduction occurring by fusion of rows 3 + 4 at the level of ventral 105. Three preventrals, 179 ventrals, divided anal plate, 126 pairs of subcaudals. 8–8 supralabials (4–5 touching eye), 9–9 infralabials, 1 + 2 temporals on each side. Weight in life 15 g.

Description. Measurements, proportions, and scutellation are summarized in Table 1. Largest specimen a male (MCZ 180392), 749 mm total length, 320 mm tail length; largest female (MCZ 180399) 424 mm total length, 115 mm tail length. Tail length strongly sexually dimorphic: 37–43% of total length in males, 24–28% of total length in females. Dorsal scales smooth, lacking apical pits, in 17–17–15 rows. Scale row reduction from 17 to 15 rows usually by fusion of rows 3 + 4 (occasionally appearing as loss of row 4) at the level of ventrals 86–113 (males, N = 7) or 78–96 (females, N = 11) (2 individ-

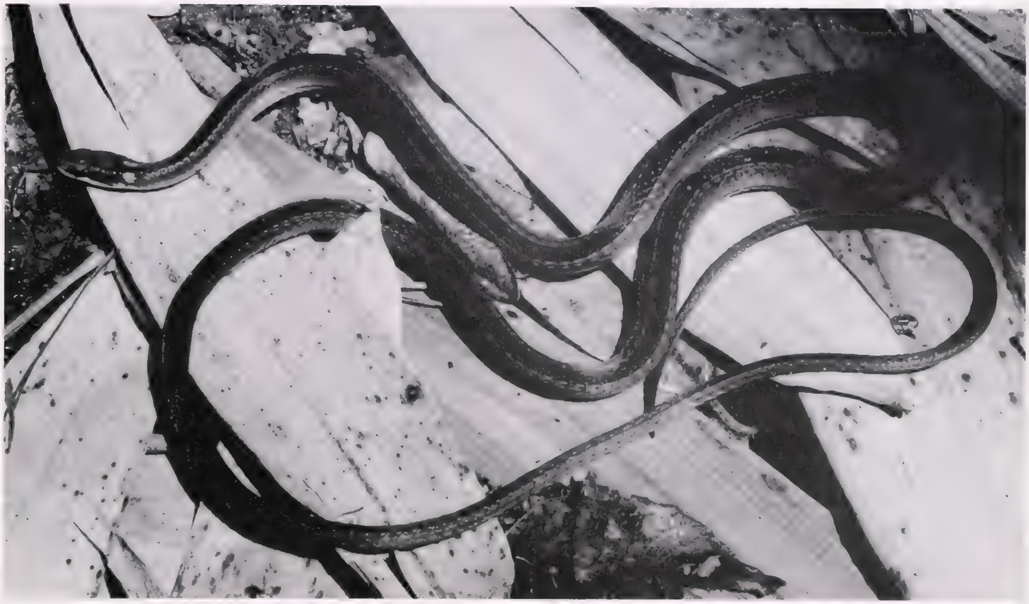

Figure 4. *Liopholidophis rhadinaea,* MCZ 180394 (male), in life.

uals had unilateral reduction of 4 + 5 on one side and 3 + 4 on the other). Ventrals 170–179 in males, 150–160 in females. Anal plate divided. Subcaudals 126–137 in males, 69–88 in females (88 subcaudals in MNHN 1988-333; maximum of 77 in the RNP series).

Rostral slightly visible from above, about 2 times wider than high. Paired internasals, each slightly wider than long, about 80% as long as prefrontals. Paired prefrontals, each wider than long, in contact with each other and with frontal, supraocular, preocular, loreal, postnasal, and internasal. Frontal roughly pentagonal (sometimes with a slightly angulate anterior border, producing a more hexagonal shape), 1.1–1.3 times longer than its greatest width (at frontal/prefrontal suture), 1.1–1.2 times longer than distance from its anterior edge to tip of snout. Parietals about 1.5 times longer than broad; interparietal suture about 70% length of frontal plate. Nasal divided ventral to nostril, in contact with rostral, internasal, prefrontal, loreal, and first 2 supralabials. Loreal rectangular to pentagonal, usually higher than wide, separated from eye by single preocular (unilateral transverse division of preocular in 3 specimens). Two postoculars; temporals 1 + 2. Supralabials usually 8 with 4–5 touching eye (11 specimens), or 7 with 3–4 touching eye (5 specimens) (1 specimen each with 7–8 and 7–6). Infralabials 8–8 (6 specimens), 8–9 (2 specimens), or 9–9 (10 specimens), the first pair in contact behind the mental, 1–4 touching an anterior genial, 4–5 touching a posterior genial (1 specimen with 1–3 and 3–4, respectively). Anterior genials approximately equal to, or slightly shorter than, posterior genials. Scattered minute pits or tubercles visible on head plates of some specimens under high magnification, especially on circumorbital series, prefrontals, and nasals.

Overall body form slender, gracile (Fig. 4). Body higher than wide; ventrolateral edge of body angulate. Head very slightly wider than neck. Pupil round. Eye moderate, its diameter 60–65% of the distance from anterior edge of eye to tip of snout; eye diameter 1.2 times the distance from eye to posterior edge of nostril.

Posterior hypapophyses, examined *in situ*, appear to be a more or less rectangular vane, with a posterior projection that does not, or only barely, overlap the centrum of the next vertebra.

Dentition. Maxillary teeth 22–28 + 2 ($\bar{x} = 23.9 \pm 1.81$; N = 16). Modal number of prefang teeth 23 (N = 7), followed by 24 (N = 3), 22 or 25 (N = 2 each), and 28 (N = 2). Essentially no diastema. The ungrooved fangs are about twice as large as the posteriormost maxillary teeth and have a rounded anterior surface and a flattened knifelike posterior surface; their tips are slightly compressed. The ultimate fang is very slightly offset laterad, but the fangs are essentially in line with the tooth row. A cleared and stained skull (MCZ 180393, female) has 16–15 palatine teeth, 25 right pterygoid teeth, and 28 right dentary teeth (left pterygoid and dentary damaged).

Hemipenis (see Fig. 30). Deeply bilobed, noncapitate, acalyculate (ornamentation consists entirely of spines), with small, nude, cylindrical awns at the tips of the lobes. Stalk of organ proximal to lobes moderately long (about 40% the length of the organ). Sulcus spermaticus deeply bifurcate, centrolineal, with the tips funnel-shaped and opening at the base of the awns. The awns are a very unusual feature of the hemipenes, which are described in detail later (see "Hemipenial Morphology in *Liopholidophis*").

Coloration in Life. Two similar but distinct color morphs are evident. Most specimens from the RNP, and the specimen from Perinet, are a "light" morph; three RNP specimens (MCZ 180385–86, 180388) are a "dark" morph described separately. The two forms differ primarily in the width of the dorsal dark brown stripe and in the shade of the brown flank coloration.

"Light" morph in life, based on MCZ 180392 (male) (Fig. 5)—Dorsum brown, including broad dark brown stripe occupying median 3 dorsal rows + ½ of adjacent rows, bordered by narrow yellowish brown dorsolateral stripe (centered on row 6 + approximately ⅓ or less of adjacent scale rows); flanks medium yellowish brown; dark brown line on lower portion of scale row 1. Top of head brown, without darker patterns. A median and a pair of dorsolateral yellowish brown nape spots. Upper and lower labials and throat whitish with some darker stippling. Anterior 10–15 ventrals whitish. Remainder of ventrals, anal plates, and subcaudals salmon pink with a few scattered dark brown specks. Dorsal and ventral patterns continue to tail tip.

"Dark" morph in life, based on MCZ 180385–86 (females) (Fig. 5)—Broad dark brown stripe occupying median 5 dorsal rows, bordered by narrow yellowish brown stripe from nape to tail tip (centered on row 6 + approximately ⅓ or less of adjacent scale rows). Flanks dark brown, of a shade somewhat lighter than the middorsal dark stripe. A somewhat irregular thin dark brown line on lower half of scale row 1 (manifested posteriorly in MCZ 180385 as a series of irregular spots at the juncture of the ventral plates and scale row 1). Three yellowish brown spots on nape. Top and sides of head brown. Upper and lower labials white, speckled with dark grayish or brownish. Throat and anterior ventrals white with some dark pigment on edges of scales. Most ventrals vivid salmon pink with some dark specks laterally. Subcaudals bright salmon pink.

In the "dark morph," the dark flank coloration occupies the lower 4½ dorsal rows anteriorly, dropping to the lower 3½ rows posteriorly. Under magnification, these scales are heavily stippled with dark brown, giving a uniform appearance when viewed by eye. In the "light morph," the flanks (first 5 dorsal rows anteriorly, first 4 posteriorly) are medium to light brown; under magnification, these scales are light brown, lightly stippled with dark brown. Two specimens, MCZ 180391 and 180400, are somewhat intermediate between the "light" and "dark" morphs: they have a narrow dark middorsal stripe (i.e., 3 rows wide), but their flanks (in preservative) are of a brown shade intermediate between typical specimens of the "light" and "dark" morphs. The light dorsolateral stripes vary somewhat in width, the variation due to the proportional involvement of rows 5 and 7 in the stripe (from marginal involvement to approximately ½ of each scale).

Although ventral pinkish pigmentation is often variably present in many snakes with otherwise immaculate venters, the pink coloration on the venter of *Liopholidophis rhadinaea* is a constant, usually vivid, feature of all specimens. The hue varies from a rather plain pink to brilliant vermillion. In its most vivid manifestation, the ventral color of *L. rhadinaea* does not match the brilliant electric hue of the similar sympatric species, *Liophidium rhodogaster*. Most specimens have a small dot of dark brown pigment at the extreme lateral edges of the ventral plates; this pigment is more extensive in MNHN 1988-333, in which the ventral plates have distinct darkened borders, than in the RNP sample. Many specimens have additional irregular scattered dark brown flecks on the venter, occasionally arranged in a pair of lines flanking the ventral midline on part of the belly.

Coloration in Preservative. Rostral and upper labials mostly white (some fine dark brown stippling, especially on rostral and anterior supralabials). Thin dark blackish line separating whitish upper labial color from the brown head cap; beginning at tip of snout about midlevel on the rostral, extending across upper border of supralabials 1–4, thence across lower edge of ventral postocular and anterior temporal, and across upper ⅓–½ of last two upper labials, ending at corner of mouth. In some some specimens the lower portion of the supralabials are also stippled with dark pigment, so that the white of the upper lip is essentially sandwiched between dark lines. Top of head brown, slightly lighter than middorsal dark stripe, lightly stippled with dark under magnfication, but essentially patternless. Throat immaculate.

Three light nape spots (Fig. 2); lateral ones usually separated from light color of throat by surrounding brown pigment (brown head cap laterally continuous with brown color of flanks); lateral nape spots confluent with light color of throat in six specimens. Nape spots bordered completely or incompletely by thin dark brown line.

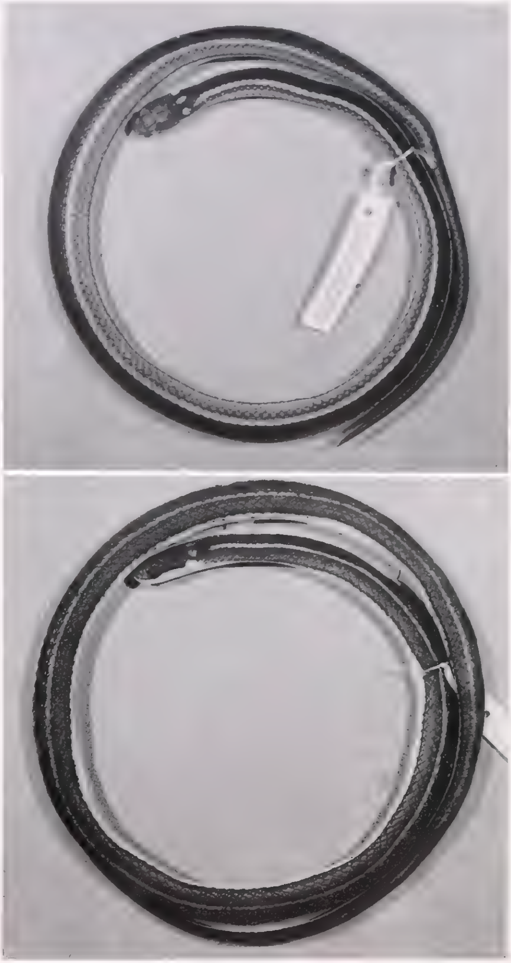

Figure 5. *Liopholidophis rhadinaea*, two color morphs. Top: Specimen of the "light" morph (MCZ 180400). Bottom: Specimen of the "dark" morph (MCZ 180385). Note the darker flanks in the latter and its narrower dorsolateral light stripe.

Middorsal stripe dark brown. Dorsolateral light stripes dirty whitish to dirty yellowish brown, bordered with thin dark brown line (sometimes incomplete along ventral edge). In some specimens of both color morphs, dorsolateral light stripes essentially restricted to scale row 6 (e.g., MCZ 180386, 180396). Light stripes in line with, but separated from, lateral nape spots by a brown collar about 2–3 scales wide. The light stripes continue to the tail tip and are not interrupted in the region of the vent.

Dark brown line on lower half of dorsal row 1, sharply separating dorsal and ventral ground colors, occasionally indistinct; interrupted briefly at the vent, then continuing at extreme lateral edge of subcaudal scales to tail tip (subcaudals otherwise immaculate). Venter dull whitish to yellowish white, depending on time in preservative (pink pigmentation lost), except for the persistent brown dots.

Natural History. *Liopholidophis rhadinaea* is diurnal and terrestrial. Most specimens were encountered while actively crossing trails or (occasionally) apparently sunning on trails. Specimens were collected from selectively logged rainforest that, however, still had a closed canopy and was deeply shaded (essentially as primary forest) in most parts.

These are inoffensive little snakes and do not attempt to bite. One specimen encountered on a trail used immobility as a defense, flattening its body against the trail and maintaining rigidity; it did not even move initially (even remaining rigid) when prodded or picked up. One specimen attempted to take refuge inside a broken bamboo stem close to the ground.

Two diet records are available for *Liopholidophis rhadinaea*, both frog eggs. A male collected early in the afternoon of 18 December 1991 (MCZ 180394) regurgitated a freshly consumed mass of frog eggs, including 16 more or less intact, plus fragments of 1–3 others. The eggs were nonpigmented with yellowish yolk and a gelatinous capsule. Capsule diameters of the formalin-preserved eggs were 10–12 mm, with the ova 3–3.5 mm. These eggs appeared similar to those of *Plethodontohyla inguinalis* (Microhylidae) observed in the RNP. That species lays clutches in tree holes (Altig and Cadle, unpublished data), often close to the ground, where they might be accessible to a terrestrial snake such as *L. rhadinaea*. Of course, the identity of the egg clutch remains uncertain, but it seems most likely to be one of the larger cophyline microhylids (*Platypelis, Plethodontohyla*), because these seem to be the only frogs with such large eggs in the RNP (personal observations). Frogs, especially microhylids, appear to be primary dietary items of other forest species of *Liopholidophis* in the RNP (see species accounts). Another male collected 6 December 1990 (MCZ 180390) at 1100 hr. contained four intact egg yolks similar in color, size, and consistency to those described for the previous specimen.

Liopholidophis rhadinaea is oviparous. Females apparently begin yolking follicles late in the dry season in the RNP: two females collected 24 and 26 October (MCZ 180385–86) had small yolking follicles. All adult females collected during the rainy season (actual dates 9 December to 14 January, including MNHN 1988-33 from Perinet) had two (four females) or three (four females) well-yolked eggs; eggs in females collected 9–17 December were unshelled oviductal eggs, whereas those collected 1–14 January all contained shelled eggs. One embryo from MCZ 180401 (collected 5 January) was in Zehr (1962) stage 21–22. Females with yolking follicles or eggs were 262–313 mm SVL. Three small juveniles with umbilical scars (162–225 mm total length; 122–170 mm SVL) were collected on 19 November and 3 January.

In the RNP, *Liopholidophis rhadinaea* is broadly sympatric with the following species of *Liopholidophis*: *lateralis, epistibes,* new species, *infrasignatus* ("*thieli*"), *grandidieri, dolicocercus,* and *sexlineatus*. Of these, all except *lateralis, grandidieri,* and *sexlineatus* are known to be microsympatric with *rhadinaea* (i.e., to occur in the closed-canopy forest habitat where all specimens of *rhadinaea* have been collected). In the RNP, *lateralis* tends to occur in more open habitats, whereas *sexlineatus* prefers marshy to aquatic habitats, and is especially common in rice paddies; *grandidieri* is known from the RNP by a single specimen collected atop a granite massif with rather open habitats (additional comments later). At Perinet, *rhad-*

inaea is broadly sympatric with at least the following species of *Liopholidophis*: *epistibes*, new species, *lateralis*, *infrasignatus* (*"thieli"*), *sexlineatus*, and *pinguis* (Domergue, 1973; Glaw and Vences, 1994; Appendix).

Discussion

The superficial similarity of *Liopholidophis rhadinaea* to some species of *Liophidium* is striking, leading Domergue (1988:specimen 2, p. 144) to refer one of the paratypes of *rhadinaea* to *"Liophidium* sp." In fact, *Liopholidophis rhadinaea* superficially resembles some species of *Liophidium* (e.g., *rhodogaster, torquatum*) much more than it does other species of *Liopholidophis.* Hence, it seems worthwhile to explore more fully the characters that *rhadinaea* shares with both genera. A detailed consideration of the relationships of *rhadinaea* within *Liopholidophis* is deferred until species accounts and detailed hemipenial descriptions of other species are given.

Strong sexual dimorphism in tail length, an unusual and unquestionably derived character within colubrids, is the most obvious characteristic indicating the relationship of *rhadinaea* to *Liopholidophis* (specifically, to the *sexlineatus* group, for which the character is here interpreted as a synapomorphy; additional comments later). Of the more than 65 species of Malagasy colubrids, only species of the *Liopholidophis sexlineatus* group show no overlap between the sexes in the relative tail length compared to the total length; in all species of the *sexlineatus* group except *pinguis,* the tail of males is >35% of total length (averages >40%; see Table 1). In addition, *Liopholidophis rhadinaea* shares other osteological, scutellational, and pattern characteristics with members of the *sexlineatus* group (see "Monophyly of the Species Groups of *Liopholidophis*"). On the other hand, hemipenial morphology is rather heterogeneous in the *Liopholidophis sexlineatus* group (see "Hemipenial morphology in *Liopholidophis*"); the hemipenis of *rhadinaea* is no more dissimilar to other members of that group than, for example, are the organs of *dolicocercus* compared to either *grandidieri* or *sexlineatus.*

In contrast to the tail synapomorphy shared between *rhadinaea* and species of the *Liopholidophis sexlineatus* group, no special similarities are obvious between *Liopholidophis rhadinaea* and *Liophidium.* Although synapomorphies for *Liopholidophis sensu lato* have not been identified, some species of *Liophidium* have derived skull and dentitional characters associated with feeding on hard-bodied lizard prey such as skinks and cordylids (Savitzky, 1981, 1983). *Liopholidophis rhadinaea* shows none of these derived features, which include the following (contrasting characteristics of *L. rhadinaea,* based on the cleared and stained skull of MCZ 180393, in parentheses): (1) basal hinge allowing teeth to fold toward the back of the mouth (teeth firmly ankylosed to jaws); (2) teeth short, blunt, and often spatulate (teeth sharp, curved, and not short); (3) compound bone of lower jaw strongly curved and articulating far forward, near the anterior end of the dentary (compound bone curved only at tip of the mandible, articulating on the posterior half of the dentary); and (4) long, free posterior dentigerous process on the dentary (posterior dentigerous process not especially long).

Morgan (1973) reviewed *Liophidium* and compared skulls of four species (*mayottensis, rhodogaster, vaillanti, torquatum*). An unusual feature of the premaxilla shared by these species was the presence of long lateral processes that overlap the anterolateral surfaces of the maxillae (confirmed by my study of a skull of *L. rhodogaster* [JEC 11571] and photographs of skulls of *mayottensis, rhodogaster,* and *vaillanti* in Morgan [1973]). In contrast, the premaxilla and maxillae of *Liopholidophis rhadinaea* are separated by a moderate gap, which seems to be the common condition in *Liopholidophis* (eight other species examined, of which the premaxilla and maxilla overlapped in *sexlineatus* only;

see "Osteological Comparisons" for specimens examined).

I also compared everted hemipenes of *Liopholidophis rhadinaea* to those of *Liophidium rhodogaster* and *Liophidium torquatum*. The hemipenes of these *Liophidium* species are deeply bilobed and spinose, as is the hemipenis of *rhadinaea*, but otherwise no special resemblances are shared between organs of *rhadinaea* and the other two. However, as a cautionary note, the organs of *L. rhodogaster* and *L. torquatum* are rather different from one another (e.g., basal naked pocket and lobes in *torquatum*, absent in *rhodogaster*; personal observations), and they are different from descriptions and figures of three other species given by Domergue (1983). Since hemipenial variation in *Liophidium sensu lato* remains unstudied, the significance of such differences will only be understood as the hemipenial morphology of it and other Malagasy colubrid genera is comprehended.

Finally, Domergue (1969:15) suggested another "key" character to distinguish species of *Liophidium* from *Liopholidophis*: venter violaceous, red, or pinkish with regular spotting in the former; yellowish to whitish with irregular spotting in the latter. Clearly, *Liopholidophis rhadinaea*, in having a pink to vermilion venter, is an exception to this generality and exceptional among species of *Liopholidophis* in this characteristic.

Given current definitions and limits for Malagasy colubrid genera, *Liopholidophis* is the most appropriate genus for *rhadinaea*. Nevertheless, this is not an unequivocal generic placement. Despite a long list of similarities, some of them putatively derived, between *rhadinaea* and the *sexlineatus* group of *Liopholidophis* (see "Monophyly of the Species Groups of *Liopholidophis*"), the disturbing lack of clear synapomorphies for *Liopholidophis sensu lato* (discussed later) makes resolution of this question problematic. Furthermore, the diversity within *Liopholidophis*, the disparity in general habitus between *rhadinaea* and the other species, and the resemblances (albeit superficial) between *rhadinaea* and species of *Liophidium*, all convene to raise questions concerning the relationships of *rhadinaea*. My cursory comparisons of *Liophidium* species in connection with this study raise similar questions for that genus, especially concerning variation in hemipenes and some of the dentitional and cranial characteristics already alluded to. The possibility of a close relationship between *Liophidium* and *Liopholidophis*, or parts thereof, should be evaluated as knowledge of species in each genus improves. (See also the subsequent section on MNHN 1988-331.)

The next species described has been confused with *Liopholidophis stumpffi* (Boettger, 1881a,b) in previous literature (Boulenger, 1893; Boettger, 1913; Domergue, 1973; Glaw and Vences, 1994). Domergue (1973) properly resurrected *Dromicus stumpffi* Boettger (1881a,b) from the synonymy of *Liopholidophis lateralis*, where it had been placed in previous general reviews of *lateralis* (Guibé, 1954, 1958). However, Domergue, as had others before (e.g., Boulenger, 1893; Boettger, 1913; Kaudern, 1922; Parker, 1925; Angel, 1936), confused a wide-ranging species of eastern and northern Madagascar with *L. stumpffi* (Boettger) (Domergue, 1973:fig. 1; followed by Glaw and Vences, 1994:336 [map]). My examination of type material of *Dromicus stumpffi* Boettger, other topotypic specimens, and specimens from eastern Madagascar referable to *Liopholidophis stumpffi sensu* Domergue (1973) convinces me that two taxa are involved. Accordingly, *Liopholidophis stumpffi* (Boettger) is here considered a species of the type locality (Nosy Be) and extreme northern Madagascar (Fig. 6). Populations previously confused with *stumpffi* Boettger (i.e., from the eastern escarpment and lowlands, the vicinity of Mahajanga in northwestern Madagascar, and Montagne d'Ambre in extreme northern Madagascar) are described as a new species. Distributional relationships between the new species and true *stumpffi* are unclear (see "Distribution").

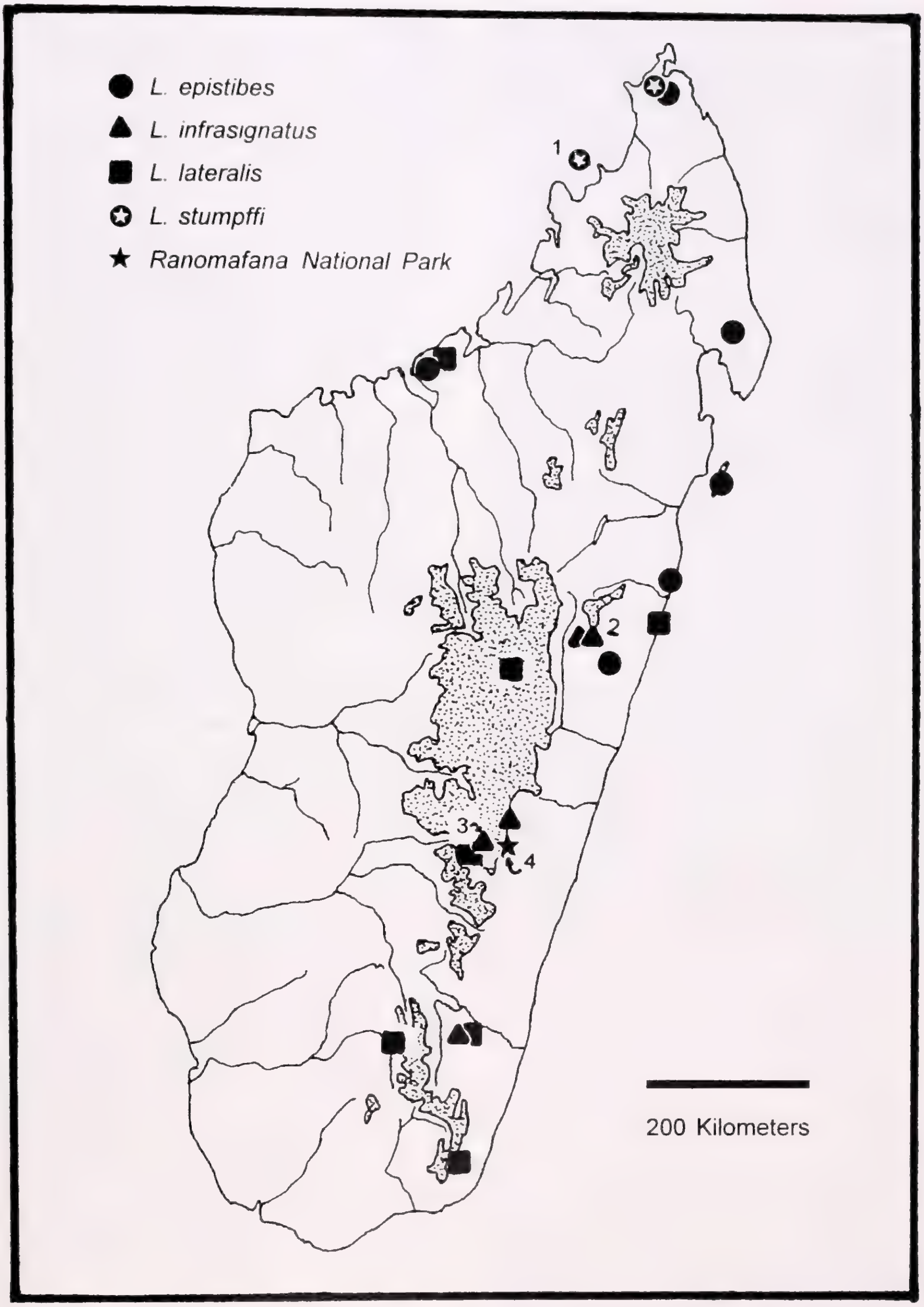
● L. epistibes
▲ L. infrasignatus
■ L. lateralis
✪ L. stumpffi
★ Ranomafana National Park
1
2
3
4
200 Kilometers

Figure 6. Localities for specimens examined of species of the *Liopholidophis stumpffi* group; these distributions are *not* comprehensive (see text for known distributions); shaded areas are above 1,000 m. All species indicated except *stumpffi* are known from the RNP, which is also the type locality for *epistibes*. Numbered localities referred to in the text and Appendix are (1) Nosy Be, type locality for *L. stumpffi* (Boettger); (2) Perinet [Andasibe], type locality for *L. thieli* Domergue [=*infrasignatus* (Günther)]; (3) Ankafana, type locality for *L. infrasignatus* (Günther); and (4) RNP.

The new species has 19 midbody scale rows and lacks extreme sexual dimorphism in tail length. Hence, it is a member of the *Liopholidophis stumpffi* group *sensu* Parker (1925) and is to be known as

Liopholidophis epistibes, new species

Figures 7–11

Tropidonotus stumpffi (not of Boettger, 1881a,b), part: Boulenger, 1893:247–248 (specimens f–g, h–i), 1915: 374. Boettger, 1913:312 (specimen from Moramanga; identity inferred on basis of locality), 1913: 322 (specimen from Nosy Sainte Marie, examined). Kaudern, 1922:445 (identity inferred on basis of locality; see "Distribution").

Liopholidophis stumpffi (not of Boettger, 1881a, 1881b), part: Parker, 1925. Angel, 1936:127 (specimens from Tsianovoha; identity inferred on basis of locality). Domergue, 1973:1401; Glaw and Vences, 1994:338 (specimens from eastern Madagascar, as discussed later [see "Distribution"]).

? *Liopholidophis lateralis* (Duméril, Bibron, and Duméril), part: Guibé, 1954, 1958. See footnote 10.

Holotype. **Museum of Comparative Zoology (MCZ) 180322** (field number JEC 11460), an adult female in good condition (Fig. 7) from Talatakely, Ranomafana National Park, 950–1,000 m, Fivondronana Ifanadiana, Fianarantsoa Province, Madagascar [21°16′S, 47°25′E]. Specimen obtained by John E. Cadle 20–26 December 1991.

Paratypes. The following specimens in the Museum of Comparative Zoology (MCZ) obtained by J. E. Cadle, identical locality data as for the holotype except the elevational range is 970–1,100 m: **MCZ 180312** (field number JE Cadle 9646), adult female, 24 October 1990; **MCZ 180313** (JEC 9802), adult female, 5 November 1990; **MCZ 180314** (JEC 9972), adult female, 24 November 1990; **MCZ 180315** (JEC 11078), adult female (skin + complete skeleton), 6–10 January 1992; **MCZ 180316** (JEC 11224), subadult male, 18 December 1991; **MCZ 180317** (JEC 11572), subadult female, 3 January 1992; **MCZ 180318** (JEC 11817), adult male, 7 December 1992; **MCZ 180319** (JEC 11836), adult male, 8 December 1992; **MCZ 180320** (JEC 11890), adult female, 11 December 1992; **MCZ 180321** (JEC 10609), adult female, 15 November 1990.

MCZ 180323 (JEC 11427), adult female (fluid + skull), 27 December 1991, Trail between Ranovao and Menarano, approximately 3.5–5 km SSW (airline) Ranomafana, approximately 600 m, Fivondronana Ifanadiana, Fianarantsoa Province, Madagascar [21°17′S, 47°28′E]. **MCZ 180324** (JEC 11797), adult female, 6–11 January 1992, Trail between Tsaratanana and Ambohipo, approximately 400–500 m, Fivondronana Ifanadiana, Fianarantsoa Province, Madagascar [21°11′S, 47°37′E].

SMF 57164, adult female, Majunga, NW Madagascar, [Fivondronana Mahajanga: Mahajanga Province; 15°43′S, 46°19′E], 7 March 1960, K. L. Koch. **SMF 17579**, subadult female, St. Marie, E. Madagascar [=Nosy Sainte Marie], [Fivondranana Ambodifotatra, Toamasina Province; 16°50′S, 49°55′E], about 1905, A. Voeltzkow (see Boettger, 1913:322). **SMF 32526–28**, adult male and two subadult females, respectively, Col [colline (Fr.) = hill] Pierre Radama, Prov. Maroantsetra, [Fivondranana Maroantsetra, Toamasina Province; 15°17′S, 50°03′E] [part of H. Bluntschili collection, collected 1931; 1,000 m elevation *fide* Mertens, 1933; =Vozontanin-d Radama ("Radama Pass") as listed by the Defense Mapping Agency, 1989].

BMNH 89.8.1.8–9 (specimens f–g of Boulenger, 1893:247 [as *Tropidonotus stumpffi*]), adult males, Tamatave [=Toamasina], [Fivondranana Toamasina, Toamasina Province; 18°10′S, 49°23′E], M. Majastre. **BMNH 92.3.7.15–16** (specimens h–i of Boulenger, 1893:248 [as *Tropidonotus stumpffi*]), adult female and male (not individually tagged), Sahambendrana, Central Madagascar[5] [Toamasina Province; 19°24′S, 48°09′E], M. Majastre.

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[5] Not located on recent maps or in gazetteers, Sahambendrana is a type locality for several anurans (e.g., *Mantidactylus tornieri* [Ahl, 1928]). Ahl (1928: 316–317) gives the locality as "Ankoraka Sahambendrana (Zentral-Madagaskar)" ("Anhoraka," presumably as a misspelling, elsewhere). The coordinates given are for "Ankoraka" listed in the Defense Mapping Agency (1989) and correspond to this locality as used by Glaw and Vences (1994).

USNM 150593–94, adult female and subadult (probably female), respectively, Mt. d'Ambre [=Ambohitra; Fivondronana Antsiranana: Antsiranana Province; 12°30′S, 49°10′E], 1963, Howard E. Uible.

Distribution. Known from scattered localities on the eastern escarpment and lowlands, from at least the RNP in the southeast to the Masoala Peninsula in the northeast; Montagne d'Ambre and vicinity at the northern tip of Madagascar; the island of Nosy Sainte Marie off the east coast; and the vicinity of Mahajanga in northwestern Madagascar (Fig. 6). A record of "*stumpffi*" from Behara (24°57′S, 46°23′E) in extreme southeastern Madagascar (Domergue, 1973:1404; Glaw and Vences, 1994:336) may represent *epistibes*.

The distribution of *epistibes* in northern Madagascar and its distributional relationship with *stumpffi* are poorly understood. I suspect that all records for "*stumpffi*" given by Domergue (1973) and Glaw and Vences (1994), except for the island of Nossi-bé (type locality for *stumpffi*), actually represent *epistibes*; the same is probably true for records of "*stumpffi*" from Fandrarazana (16°45′S, 49°44′E) reported by Kaudern (1922:445), from Tsianovoha (=Tsianovoho; 21°57′S, 47°21′E) reported by Angel (1936:127), and from Moramanga (18°56′S, 48°12′E) reported by Boettger (1913:312). Nonetheless, specimens of "*stumpffi*" from northern Madagascar (e.g., Marojezy, as listed by Domergue, 1973, and Glaw and Vences, 1994) will have to be reexamined to determine whether or not they are referable to *epistibes*. For example, the specimen from Marojezy just mentioned (Domergue, 1973: table I) has an unusually high subcaudal count for *epistibes* females (102; cf. Table 2) but a rather typical one for *stumpffi* females; it may represent *stumpffi sensu stricto* (i.e., of Boettger, 1881a,b).

All specimens I examined from eastern Madagascar (Masoala Peninsula south) that would be referred to *Liopholidophis stumpffi sensu* Domergue (1973) and Glaw and Vences (1994) are referred to *epistibes*. I have seen specimens of *stumpffi sensu stricto* only from Montagne d'Ambre (Antsiranana) and vicinity in extreme northern Madagascar and from the island of Nosy Be (type locality; Fig. 6 and Appendix). It is unclear whether the populations of *epistibes* around Mahajanga and Montagne d'Ambre (Fig. 6) are isolated from the eastern part of the range or whether the distribution of *epistibes* is continuous throughout northern Madagascar.

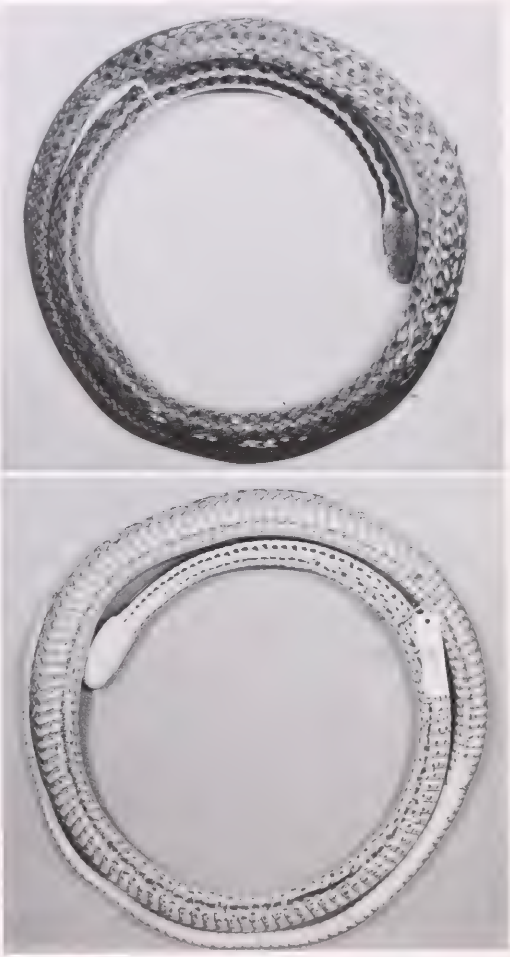

Figure 7. *Liopholidophis epistibes*, new species, holotype (MCZ 180322, female), in dorsal and ventral views. Approximately ×0.46.

Within the RNP, *Liopholidophis epistibes* is apparently widespread, with a known elevational range of approximately 500–1,100 m. One confirmed locality, Tamatave (=Toamasina), is near sea level, assuming that Tamatave was not simply the shipping point.

Etymology. The specific epithet is an adjective meaning "on the trail," modeled after the Greek ἀποστιβής ("off the path"; Liddell and Scott, 1968). From *epi* ("upon") + *stibos* ("trail"), in reference to the usual circumstances in which I encountered this species.

Diagnosis. A species of *Liopholidophis* distinguished from all other species by the following combination of features: scales in 19 rows at midbody, reducing to 17 posteriorly; relatively long tail and high number of subcaudals (27–34% of total length and 86–104, respectively, sexes combined); dorsolateral light stripe on rows 5–7 or 5–6 on neck, 5–6 on anterior part of body, present or absent posteriorly (rows 4–5 when present); dark postocular stripe more or less continuous with series of dark blotches on side of neck, separating dorsolateral light stripe from light color of throat; anterior 10–30 ventral plates with series of black spots, usually elongate, inset 20–25% the width of the plate from lateral edge (venter otherwise may be more or less immaculate, but usually heavily spotted and/or suffused with black or dark gray, especially posteriorly).

Liopholidophis epistibes differs from members of the *sexlineatus* group in having 19–19–17 dorsal scale rows (vs. 17–17–15). It differs from other members of the *stumpffi* group, *stumpffi*, *lateralis*, and *infrasignatus*, primarily in aspects of color pattern.

Liopholidophis epistibes and *L. stumpffi* are separable by the disposition of the dorsolateral light stripes and other pattern characteristics (see "Remarks" for more detailed comparison of specimens of both species from the region of sympatry). In *epistibes*, the light stripe occupies scale rows 5–6 or 5–7 anteriorly, 5–6 at midbody and, when present posteriorly, rows 4–5; the stripes are not continuous with the light color of the throat (separated by confluence of postocular dark stripe and dark pigment on lateral surface of neck; Fig. 8). In *stumpffi*, the dorsolateral stripe occupies rows 4–5 anteriorly and at midbody (posteriorly indistinct in adults I have seen, but appears to be restricted to row 4; see "Remarks" in species account for *stumpffi*); it is confluent with the light coloration of the throat (Fig. 8). The dark postocular stripe is comparatively broad in *epistibes*, is confluent with dark blotches on the side of the neck (occasionally briefly interrupted), and occupies the middle to lower half of the ultimate supralabial (Fig. 8); the postocular stripe in *stumpffi* is narrower, occupies the upper portion and/or suture line of the ultimate and penultimate supralabials, and does not continue posterior to the jaw angle (Fig. 8). The dark head cap does not extend well below the jaw line in *epistibes*, whereas in *stumpffi* the dark head cap curves around the angle of the jaw (Fig. 8). The two species also differ in ventral pattern (cf. Figs. 7, 11, and 24): virtually immaculate in *stumpffi* except for encroachment of dark flank pigment laterally, and usually a series of indiscrete punctations at extreme anterolateral edge of ventral plates (not inset from edge); usually heavily spotted or suffused with dark gray or black in *epistibes*, especially posteriorly, and with series of discrete, elongate black spots on each side of anterior 10–30 ventral plates, inset 20–25% from the lateral edges of the plates (Fig. 8). *Liopholidophis epistibes* averages about 10 more ventral plates in both sexes than *stumpffi*, and the ranges in the two species are virtually nonoverlapping (Table 2). Hemipenes of *epistibes* and *stumpffi* (described in detail later) also differ: *epistibes* has about three rows of enlarged spines on the outer surface at the base of each hemipenial lobe, whereas *stumpffi* has only a single row; in addition, nude areas between the lobes are more extensive in *epistibes* than in *stumpffi*.

Liopholidophis epistibes differs from *L. lateralis* in the position of the lateral stripes: in *epistibes* on dorsal rows 5–6 or 5–7 anteriorly, 5–6 at midbody, usually fading

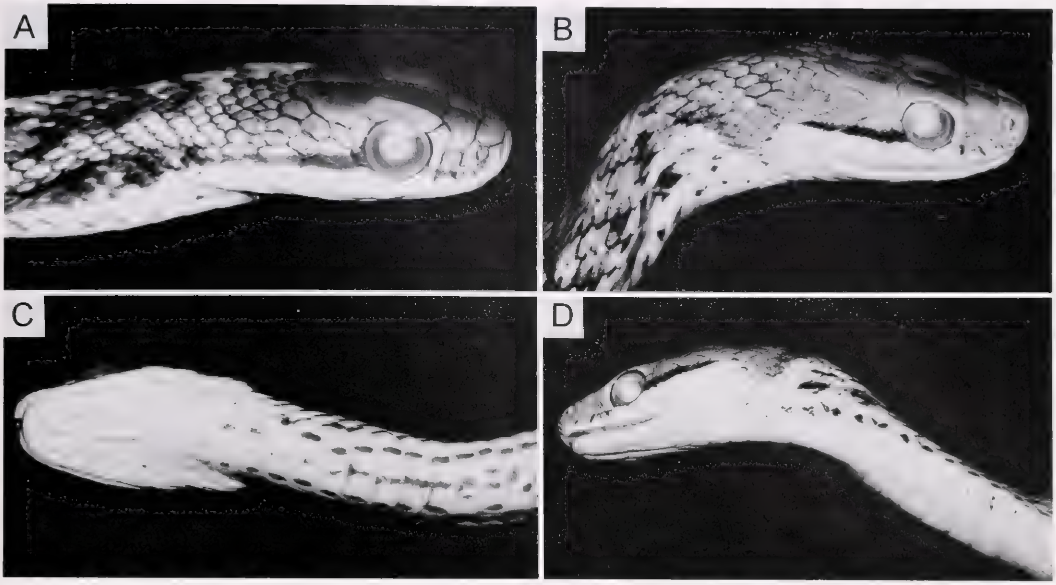

Figure 8. Comparison of *Liopholidophis epistibes*, new species (A, C; MCZ 180319), and *Liopholidophis stumpffi* (Boettger) (B, D; SMF 17577), showing the following distinguishing features of head and neck. (1) Postocular bar extending diagonally across ultimate supralabial, intersecting lower edge of ultimate supralabial at the mouth line (*epistibes*); restricted to upper edge and suture line of ultimate supralabial (*stumpffi*). (2) Postocular bar confluent with black pigment on side of neck (*epistibes*); postocular bar short, ending on last supralabial (*stumpffi*). (3) Dorsolateral light stripe separated from light gular coloration by confluence of postocular bar and black spots on side of neck (*epistibes*); continuous with light coloration of gular region (*stumpffi*). (4) No dark wedge from head cap extending below mouth line at angle of jaw (*epistibes*); dark wedge from head cap extends below mouth line (*stumpffi*). (5) Discrete, elongate dark spots laterally on anterior ventrals, but inset from lateral edge of ventral plates (*epistibes*); spots, when present, diffuse, rounded, and present at extreme anterolateral edges of ventral plates (*stumpffi*).

posteriorly (and nearly always indistinct on tail); and anteriorly separated from the light color of the throat by dark pigment on the side of the neck (Figs. 8, 23). In *lateralis*, the lateral stripes are centered on row 4, with adjacent rows usually involved; the stripes are distinct the length of the body, continue to the tail tip, and are continuous with the light color of the throat (occasionally barely separated by a narrow extension of the dark flank color; Figs. 23, 26; see also Glaw and Vences, 1994:fig. 505). The venter of *epistibes* may or may not be generally speckled with black (Figs. 7, 11), whereas that of *lateralis* never appears to be (black spots sometimes present at lateral edges of ventral plates).

Liopholidophis epistibes has a longer tail (27–34% of total length, sexes combined) and more subcaudals (91–104, males; 86–96, females) than *infrasignatus* (tail 21–27%; subcaudals 66–81, males; 62–73, females) (see Table 2, including footnote 1 for possible amplification of ranges for *epistibes*). *Liopholidophis epistibes* is also of more gracile habitus than *infrasignatus*, and the anterior dorsal colors are predominately contrasting black and yellow (browns, olive browns, to olive gray in *infrasignatus*). The orientation of the postocular dark bar also differs somewhat in *epistibes* and *infrasignatus*. In *epistibes*, the bar extends more or less horizontally posterior to the eye, passing across the upper portion of the penultimate supralabial (Figs. 8, 23); in *infrasignatus*, the bar extends at an angle downward across the penultimate supralabial, usually having a somewhat separated portion on the lower portion of the ultimate supralabial (Figs. 23, 28).

Data on the Holotype (MCZ 180322).

The holotype is a gravid adult female with five eggs, as determined by palpation. Total length 753 mm; tail length 218 mm (29% of total length). Greatest head width (parietal region) 9.75 mm, head length 18.95 mm from tip of snout to end of mandibles. Horizontal diameter of eye 3.91 mm; anterior edge of eye to posterior edge of nostril 2.87 mm. Dorsals 19–19–17, the reduction occurring by fusion of rows 3 + 4 at the level of ventral 108. Three preventrals, 166 ventrals, divided anal plate, 90 pairs of subcaudals. 8–8 supralabials (4–5 touching eye), 10–10 infralabials, 2 + 2 temporals on each side, 26 + 2 right maxillary teeth with essentially no diastema. Weight in life 44 g.

Description. The following description is based on the 16 females and 8 males in the type series. Measurements, proportions, and scutellation are summarized in Table 2 (see footnote 1 in Table 2 for possible extreme values for some statistics reported here). Largest specimen a female, 829+ mm total length, tail 195+ mm; largest male 709 mm total length, 238 mm tail length. Tail length not sexually dimorphic, 28–34% of total length in males, 27–31% in females. Dorsal scales smooth, in 19–19–17 rows; 0–2 apical pits present (see "Remarks"). Scale row reduction from 19 to 17 rows by fusion of rows 3 + 4 (occasionally appearing as loss of either row 4 or 3) at the level of ventrals 87–108 (N = 12). Ventrals 157–166 in males, 151–167 in females. Anal plate divided. Subcaudals 91–104 in males, 83–96 in females. Eight upper labials (rarely seven or nine) with 4–5 touching eye. Lower labials usually 10–10 (14 specimens), with 8–8 (1), 9–10 (5), 10–11 (1), or 11–11 (1) being uncommon variants; first pair in contact behind the mental, 1–4 or 1–5 touching an anterior genial, 4–5 or 5–6 touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular single. Temporals usually 2 + 2 (rarely 1 anterior or posterior temporal; in one instance, 3 posterior temporals).

Body form slender (Figs. 9–10), slightly higher than wide; ventrolateral edge of body slightly angulate to rounded. Head slightly wider than neck. Pupil round. Eye large (Figs. 8, 23), its diameter greater than the distance between eye and posterior edge of nostril ($\bar{x}$ = 1.36 ± 0.18; range 1.10–1.69; N = 13). Scattered pits and tubercles present on head plates.

Hypapophyses (MCZ 180315, complete skeleton) on posterior trunk vertebrae keellike, with a low projecting vane, and a bluntly pointed posterior projection extending beneath the centrum of the next posterior vertebra.

Dentition. Maxillary teeth 22–29 + 2 (N = 16; $\bar{x}$ = 26.4 ± 2.06 prefang teeth). Diastema absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, 2 times as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. Two skulls (MCZ 180315 and 180323, both females) have the following numbers of teeth, respectively: 17–20, 19–17 palatine teeth; 34–36, 37–38 pterygoid teeth; and 31–30, 32–31 dentary teeth.

Domergue (1973) reported 16–17 prefang maxillary teeth in *Liopholidophis epistibes* ("*stumpffi*"), which, in comparison to my counts, suggests failure to count empty sockets or otherwise erroneously low counts. Nevertheless, the range of maxillary tooth counts in my series is broad. Any geographic pattern is, however, difficult to discern because most of my counts are from the RNP series, where the range is 24–29 prefang teeth.

Hemipenis (see Fig. 34). Deeply bilobed, noncapitate, acalyculate (ornamentation consists entirely of spines), with a very short basal stalk. Sulcus spermaticus deeply bifurcate, centrolineal. The lobes diverge strongly from one another, lying at essentially right angles to the stalk. Tips of lobes with a central depression ("umbelliform", as described later [see "Hemipenial Morphology in *Liopholidophis*"]).

Coloration in Life (see Glaw and

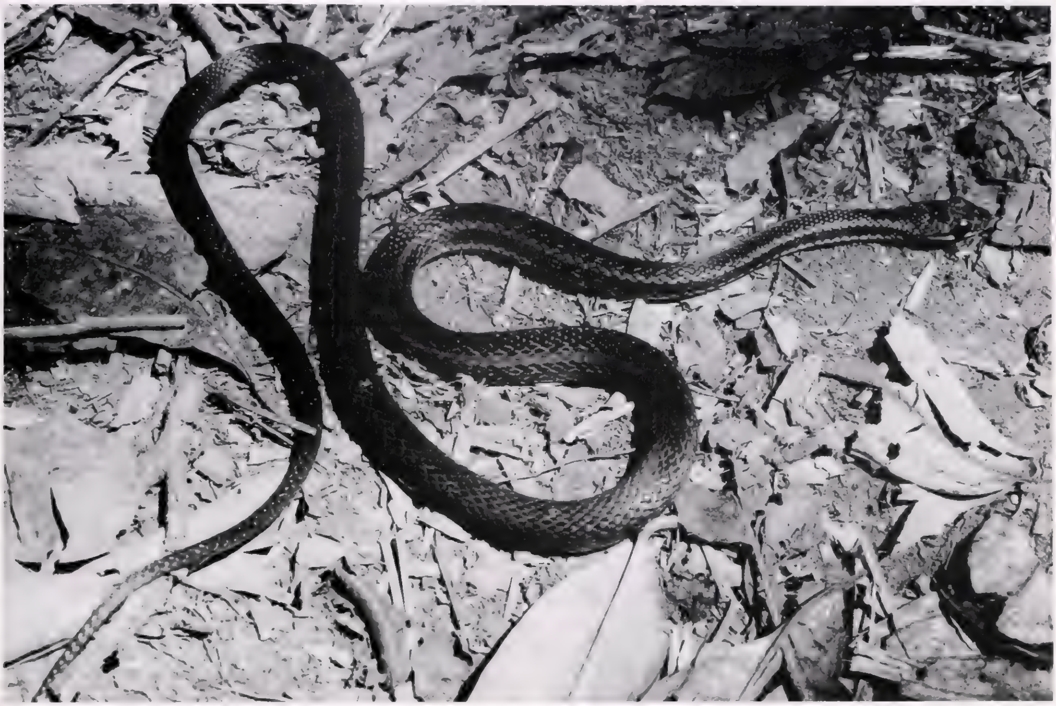

Figure 9. *Liopholidophis epistibes*, new species. Specimen from the RNP, MCZ 180319, showing typical fading of dorsolateral stripes about midbody.

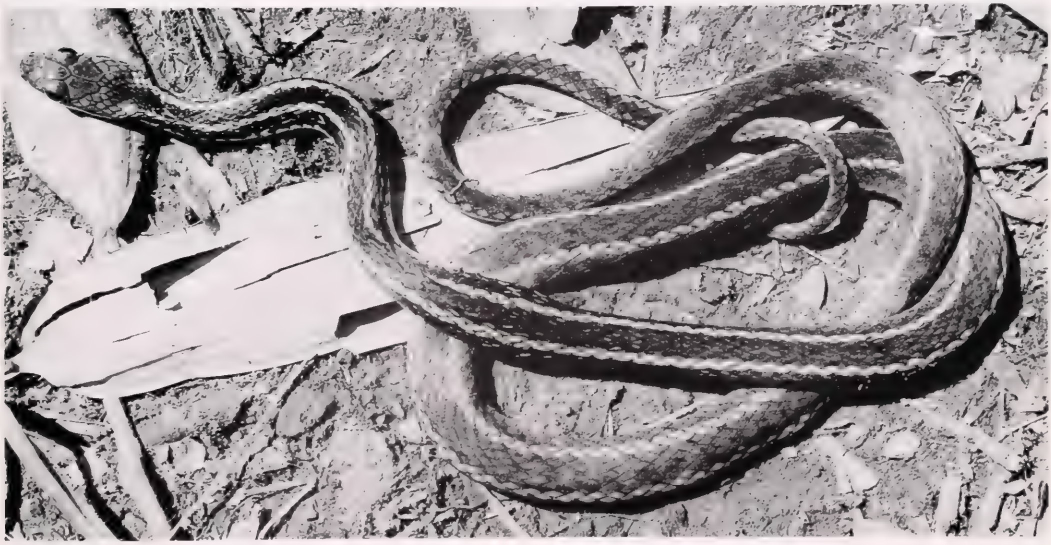

Figure 10. *Liopholidophis epistibes*, new species. Specimen from the RNP, MCZ 180323. This specimen has unusually complete and vivid dorsolateral stripes, extending not only the length of the body, but the tail as well.

Vences, 1994:pl. 347 of "stumpffi"). MCZ 180312 (female)—Dorsum greenish brown anteriorly, grading to rich medium brown by midbody, to olive brown posteriorly. Yellow dorsolateral stripes begin on nape, turning to yellowish brown but becoming indistinct by midbody. Top of head olive greenish. Black postorbital stripe extending across middle portion of posterior supralabial, and continuous with lateral stripe or series of blotches on side of neck. Upper labials, lower labials, and throat pale yellow. Venter olive greenish with black speckling laterally.

MCZ 180313 (female)—Anteriorly, middorsum and flanks black, gradually fading to dark olive brown by ⅓ of the way along the body. Posterior dorsum dark olive brown with vague obscure black spotting and flecks. Dorsolateral pale yellow stripe begins on nape and rapidly fades to yellowish brown, widening and fading posteriorly so that it is barely distinct from middorsal and lateral areas. Top of tail dark brown. Top of head olive brown. Pupil round. Iris dark brown. Black postocular stripe extends diagonally across the middle of the ultimate supralabial to angle of jaw. Upper labials anterior to eye olive; posterior ones pale yellow. Lower labials and gular region pale yellow. Anteriorly, ventrals and first scale row pale yellow; black spot inset from lateral edge of ventrals. All ventrals posterior to approximately the first 10 heavily flecked and spotted with black. Ventral ground color pale yellow anteriorly, fading to brownish yellow, with orangish wash on posterior ⅔ of body. Subcaudals dirty white with very light orange tinge, unmarked except for a few scattered black specks.

The color plate of *Liopholidophis "stumpffi"* given by Glaw and Vences (1994:pl. 347; specimen from Perinet [=Andasibe]) is of *L. epistibes*. That specimen is similar to coloration of some specimens from the RNP, but the dorsolateral stripes in RNP specimens tend to be more intensely yellow. Most specimens have a paired series of discrete black blotches (usually slightly offset) between the dorsolateral stripes on the neck and anterior body and a series along the flanks below the dorsolateral stripes in the same area. Blotches in the lateral series are large (4–7 scales in diameter), squarish, connected anteriorly with the postocular stripe, and sometimes more or less fused with one another. Both the dorsal and lateral blotches become smaller posteriorly, either remaining as small punctations the length of the body or disappearing altogether.

Coloration in Preservative. Freshly preserved specimens retain much of the original pattern, although the dorsal ground colors become brown to olive brown (blackish anteriorly), and the dorsolateral stripes become greenish yellow, fading to light grayish posteriorly. The stratum corneum is lost easily from the dorsal scales, giving such specimens a grayish cast. The venter becomes dirty yellowish or whitish, with dark gray or black markings. The amount of black pigment on the venter varies considerably in the RNP sample—from almost none to heavy spotting or general suffusion with dark pigment, most prominent posteriorly (Figs. 7, 11).

Consistent features of the pattern in *Liopholidophis epistibes* include the dorsolateral light stripe involving scale rows 5–6 or 5–7 anteriorly, separated from the light gular coloration by extension of the dark postocular stripe along the neck (Figs. 8, 23). The dorsolateral stripes usually broaden on the nape (Figs. 7, 10), giving the appearance of a pair of light nape spots connected to the stripes. Otherwise, the dorsolateral stripes vary considerably in length and discreteness; in most specimens they fade (but are still evident) by midbody (Fig. 9), but in others they are discrete well onto the tail (Fig. 10). In most specimens, scattered dorsal scales on the anterior body have bright white borders. The lower portion of scale row 1 is lighter (yellowish in life) than the other dorsal rows. A series of discrete, elongate black spots on the anterior 10–30 ventral plates, and inset 20–25% from the lateral edge of the plate, is a constant feature (Fig. 8). Otherwise, the venter is highly variable in pattern: more or less immaculate (Fig. 11), having an additional median series of spots or continuous line that may run the length of the body (Fig. 7), having irregular dark splotches of varying densities (Fig. 11), being generally suffused with dark pigment and spotting, or some combination of the preceding. Ventral pigmentation is nearly always denser posteriorly than anteriorly. The ventral pigmentation does not seem to develop ontogenetically, as some small juveniles (e.g., MCZ 180316; SVL 197 mm) already show extensive development of posterior spotting on the venter (as well as the anterior ventral spots characteristic of *epistibes*).

Natural History. Liopholidophis epistibes is diurnal and terrestrial. Most specimens from the RNP were collected actively crossing trails during morning hours, occasionally sunning in leaf litter or bare earth on trails. Most specimens were collected from primary montane rainforest, 950–1,100 m elevation; two specimens were from degraded secondary growth at lower elevations in the RNP area.

Liopholidophis epistibes dorsoventrally flattens the neck in defensive display, highlighting the white borders to some of the dorsal scales and exposing white patches of skin between; it bites readily. The white patches of skin are generally adjacent to scales with white borders; otherwise, the skin is dark grayish, enhancing the effect of the white patches when the neck is inflated.

Two specimens of *Liopholidophis epistibes* contained food. MCZ 180319 (SVL 421 mm) contained one *Platypelis pollicaris,* a small, nocturnal, arboreal microhylid frog, swallowed head first. MCZ 180318 (SVL 390) contained one *Plethodontohyla alluaudi,* a small terrestrial (leaf-litter) microhylid, swallowed head first.

Three females from the RNP contained eggs: MCZ 180313 (SVL 522 mm; collected 5 November; 6 unshelled oviductal eggs), MCZ 180314 (SVL 558 mm; 24 November; 6 unshelled oviductal eggs), and MCZ 180322 (SVL 535 mm; 20–26 December; 5 shelled oviductal eggs). No embryos were detected in the first two; MCZ 180322 (holotype) was not dissected. Domergue (1973) reported gravid females of *Liopholidophis epistibes* (*"stumpffi"*) (SVLs 605–675 mm; all from Perinet) containing 3–6 eggs in November and December, and a female (SVL 567 mm) from Perinet that laid a clutch of 4 eggs (2 additional eggs unpassed) on 19 December. Thus, *Liopholidophis epistibes* is oviparous.

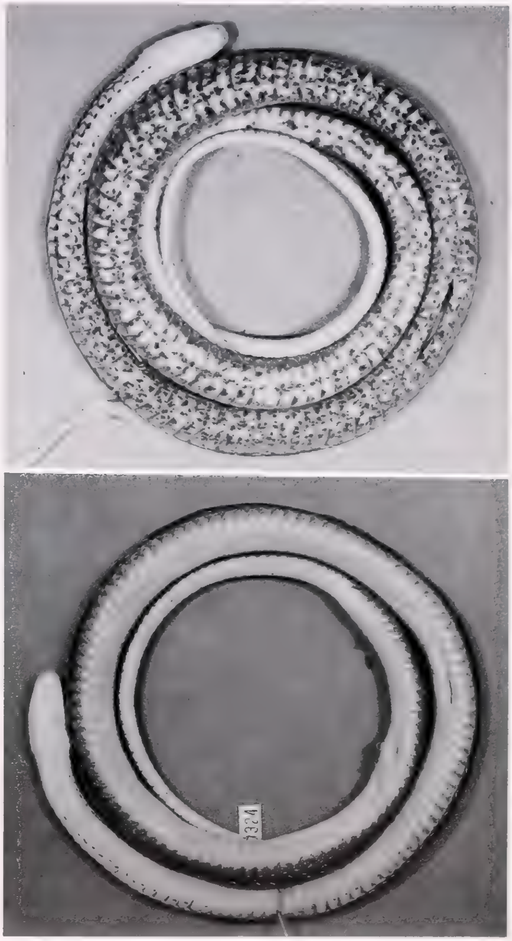

Figure 11. Variation in ventral pigmentation in *Liopholidophis epistibes* from the RNP. Top: MCZ 180313. Bottom: MCZ 180324. The latter specimen had the least ventral pigmentation of any specimen of *epistibes* examined, but even so still had the elongate spots on anterior ventrals. See also Figure 7.

In the RNP area, *Liopholidophis epis-*

tibes is microsympatric with the following species of the genus: *rhadinaea, infrasignatus, dolicocercus,* and *lateralis*—and more broadly sympatric with *grandidieri* and *sexlineatus. Liopholidophis epistibes* is broadly sympatric with *L. stumpffi* in the vicinity of Montagne d'Ambre in northern Madagascar (see "Remarks").

Remarks. From the region of broad sympatry between *epistibes* and *stumpffi* in the vicinity of Montagne d'Ambre (=Antsiranana; Fig. 6), I examined two specimens of *epistibes* (USNM 150593–94, adult female and small juvenile, probably female, respectively) and three specimens of *stumpffi* (MCZ 54368, adult female; MNHN 1893-211, adult male; and USNM 150595, small juvenile male). All of these specimens are readily identified by characters given in the diagnosis, with no intermediacy apparent.

The two specimens of *epistibes* from the Montagne d'Ambre area are somewhat distinguishable from the other specimens of *epistibes* examined in the following ways that may indicate geographic variation: (1) their ventral counts (151–152) are lower than the range for other specimens (157–167) (a trend weakly suggested by their low subcaudal counts as well), and (2) the black spots on the anterior ventrals are less elongate, somewhat smaller, and more irregular than those of other specimens. Nonetheless, the ventral spotting is typical of *epistibes,* and none of the specimens of *stumpffi* showed any approach to this type of patterning. USNM 150593 (adult female) has extensive irregular spotting on the posterior venter, as is characteristic of many specimens of *epistibes,* but unknown in *stumpffi.*

Domergue (1973) reported apical pits as lacking in *Liopholidophis epistibes* ("*stumpffi*"), with the exception of one specimen having two apical pits. My observations revealed that the number of apical pits varies from 0 to 2 within an individual, often with only widely scattered dorsal scales having pits. Some individuals had much greater frequency of pits than others; when present, the pits seemed to be more frequent on midbody and posterior dorsal scales than on the anterior scales.

The Malagasy name *tsiririatra* is used in the RNP region for *Liopholidophis epistibes,* similar to the name *antsiririatra* reported by Domergue (1973:1405) for this species in east central Madagascar.

SYNOPSES OF OTHER SPECIES OF LIOPHOLIDOPHIS

Liopholidophis Mocquard, 1904

Type Species. Liopholidophis grandidieri Mocquard, 1904 (designated by Williams and Wallach, 1989:87).

Content. Nine recognized species, as follows: *Liopholidophis dolicocercus* (Peracca), *Liopholidophis epistibes* Cadle, *Liopholidophis grandidieri* Mocquard, *Liopholidophis infrasignatus* (Günther), *Liopholidophis lateralis* (Duméril, Bibron, and Duméril), *Liopholidophis pinguis* Parker, *Liopholidophis rhadinaea* Cadle, *Liopholidophis sexlineatus* (Günther), *Liopholidophis stumpffi* (Boettger). One undescribed species is recorded from Montagne d'Ambre at the northern tip of Madagascar (Raxworthy and Nussbaum, 1994a), from where *stumpffi* and *epistibes* are also known (see later).

Distribution. Madagascar.

KEY TO SPECIES

Most species of *Liopholidophis* can be distinguished by details of color pattern, tail proportions, and certain scale characters (especially dorsal scale rows and subcaudal counts). With the possible exception of separating *sexlineatus* and *pinguis* in the last couplet, the following key should allow easy identification of specimens. Males of *sexlineatus* and *pinguis* are easily separated on the basis of relative tail lengths and subcaudal counts, but females are not (and males of the latter, lacking extremely elongate tails, are easily mistaken for females of the former); previous keys (Parker, 1925; Guibé, 1958; Glaw and Vences, 1994) reliably identify only males. Compounding the difficulty is the fact that

I have seen only 11, mostly rather old, specimens of *pinguis*, and the extent of variation in mensural and meristic characters is unknown in that species; in any case, the variation in such features overlaps considerably when females of *sexlineatus* and *pinguis* are compared (cf. Table 1). Parker (1925) commented that *pinguis* was "of rather stouter habit than its allies" (*pinguis* [L.] = fat), but that seems clearly true only when comparing larger specimens of *pinguis* to such rather gracile species as *rhadinaea* and *stumpffi* (Parker had only a single specimen of *pinguis*, and that specimen is exceptionally large, perhaps giving a misleading impression of body form). Similarly, the head plate proportions used by Parker (1925:key) to characterize *pinguis* would not likely stand rigorous scrutiny with additional specimens and statistical comparisons. The pattern characters used in the following key appear to work well for the specimens examined (see also "Species Accounts"), but users of the key should be aware that the characteristics used in couplet 8 may not hold once *pinguis* is better understood. Much variation also exists in pattern and scalation in the nominal taxa *lateralis* and *sexlineatus*, and these taxa may be found to be composites once that variation is more thoroughly studied.

Following the key, the species accounts treat the five species of *Liopholidophis* in addition to *rhadinaea* and *epistibes* occurring within the RNP and, in addition, provide brief notes on *pinguis* and *stumpffi*.

1. Dorsal scales in 19 rows at midbody, reducing to 17 posteriorly 2

Dorsal scales in 17 rows at midbody, reducing to 15 5

2. Dorsal ground color black to grayish black; light dorsolateral stripe centered on row 4 (with parts of adjacent rows also involved), continuous and vivid from neck to tail tip, anteriorly confluent with light color of throat; venter usually immaculate except for spots at extreme lateral edges of ventrals in some specimens .... *Liopholidophis lateralis* (Duméril, Bibron, and Duméril)

Dorsal ground color brown, olive, or blackish (may be grayish in preservative); light dorsolateral stripe anteriorly on rows 4–5, 5–6, or 5–7 (often indistinct on posterior body and tail, but usually on rows 4 or 4–5 posteriorly when present); dorsolateral stripe anteriorly confluent or not with light color of throat; venter often heavily marked with blackish pigment, which may tend to form midventral line 3

3. Tail short: 23–27% of total length in males, 21–24% of total length in females; fewer than 85 subcaudals in males, fewer than 75 in females; venter with or without dark pigment, which *may* tend to form broken longitudinal lines; dorsolateral light stripe anteriorly on rows 5–6 .... *Liopholidophis infrasignatus* (Günther)

Tail rather long: 28–34% of total length in males, 27–34% of total length in females; more than 90 subcaudals in males, more than 80 in females; venter with or without dark pigment; dorsolateral light stripe anteriorly on rows 5–6, 5–7, or 4–5 4

4. Dorsolateral light stripe anteriorly on scale rows 5–6 or 5–7, separated from light color of throat by dark pigment; black postocular stripe extending diagonally across middle or lower portion of posteriormost supralabial, and continuous with black pigment on side of neck; venter immaculate or (usually) with dark spots or general dark suffusion, especially posteriorly; anterior ventrals with elongate black spots inset 20–25% from edges of plates; dark wedge of head cap does not extend ventral to mouth line at jaw angle .... *Liopholidophis epistibes* Cadle

Dorsolateral light stripe anteriorly on scale rows 4–5, continuous with light throat pigment behind angle of jaws; black postocular stripe on posteriormost supralabial restricted to uppermost part of scale and/or dorsal suture line, ending at posterior supralabial (not continuous with dark lateral neck pigment); venter essentially immaculate except for dark dorsal pigment narrowly encroaching laterally; dark spots on anterior ventrals, when present, at extreme lateral edges of plates; dark head cap extends as a wedge ventral to mouth line at jaw angle .... *Liopholidophis stumpffi* (Boettger)

5. Ventral scutes (except for anteriormost) solid black, or black with regular creamy white border (forming cream stripe at lateral edge of ventral plates). Dorsum uniform brownish; with black reticulations, blotches, or chevrons (especially posteriorly); or with general black suffusion. Lateral or ventrolateral black stripe may be present on rows 2 + 3, and/or row 1 + adjacent edge of ventrals 6

Ventral scutes never solid black, or black with bordering cream-colored stripe (may be immaculate to heavily, but irregularly, splotched or patterned with dark pigment). Dorsum distinctly striped or not (when present, consisting of dark and light brown stripes, or lateral black stripes); never with dark reticulations, paired blotches, or chevrons 7

6. Venter solid black (no white or cream stripe at lateral edge of ventral scutes); lateral black stripe on rows 2 + 3; subcaudals more than 200 in males, more than 100 in females .. .. *Liopholidophis grandidieri* Mocquard

Venter black with cream or white stripe at lateral edges of ventral scutes; black stripe at juncture of ventral plates and first dorsal row, but no *lateral* black stripe on rows 2 + 3; subcaudals less than 200 in males (highest observed, 164), less than 100 in females (highest observed, 88) .... *Liopholidophis dolicocercus* (Peracca)

7. Size diminutive and slender (maximum <750 mm total length in males, <500 mm in females); 3 light (yellowish in life) nape spots; striped pattern consisting of contrasting shades of brown with broad median dorsal dark brown stripe 3–5 scales wide, bordered by narrow light yellowish brown stripe centered on row 6; venter pink to red in life, unmarked except for occasional fine dark peppering ... *Liopholidophis rhadinaea* Cadle

Size larger and more robust (maximum >850 mm total in males, >650 mm in females); no light nape spots; dorsal pattern striped or not, but stripes black when present; venter not pink to red in life, often densely marked with dark pigment 8

8. Relative tail length not strongly sexually dimorphic (in males 30–35% of total length, in females approximately 25% of total); subcaudals in males <110; stripes usually indistinct at least on anterior part of body, more distinct on posterior body and tail (when present, consisting of blackened suture line between ventrals and dorsal row 1, and lateral stripe or series of spots or dashes on row 3 anteriorly, dropping to suture line between 2 and 3 posteriorly; venter not heavily marked with black (some specimens with edges of ventrals marked with black, or with lateral or median series of small spots) ... *Liopholidophis pinguis* Parker

Relative tail length strongly sexually dimorphic (in males >40% of total length, in females 24–30%); subcaudals in males >120; stripes distinct entire length of body and tail (consisting of black stripe at border between ventrals and dorsal row 1, and lateral stripe involving rows 2 + 3, occasionally 4; indistinct stripe sometimes present at the suture between rows 6 and 7; occasionally rows 1–3 and adjacent venter are entirely black); venter more or less immaculate, to heavily and irregularly marked with black .... *Liopholidophis sexlineatus* (Günther)

The *sexlineatus* Species Group (Parker, 1925)

Figures 12–22 (see also Figs. 1–2, 4–5); Table 1

Content. *Dromicus sexlineatus* Günther, 1882:264.
Dromicus dolicocercus Peracca, 1892:1–3.
Liopholidophis grandidieri Mocquard, 1904:304.
Liopholidophis pinguis Parker, 1925:390.
Liopholidophis rhadinaea Cadle, present work.

Liopholidophis dolicocercus (Peracca)

Figures 12–17

Dromicus dolicocercus Peracca, 1892:1–3, fig. 1a–d (Type locality, "Valle dell'Umbi (Andrangoloka)" [Valley of the Umbi River (Andrangoloka)] [=Andrangoloaka]. Holotype, Museo Regionale di Scienze Naturali, Torino (MZUT) 796 (Fig. 13). Peracca (1892:3) was explicit about basing his specific epithet on the Greek word *δόλιχος* but incorrectly transliterated the name as *dolicos*, rather than correctly as *dolichos*. Under Article 32b-c of the *International Code*, however, his name stands as the correct original spelling, despite having been unjustifiably emended by all subsequent authors except Parker (1925). The name is here resurrected from the synonymy of *Liopholidophis sexlineatus* (e.g., Guibé, 1958; see "Remarks").

Liopholidophis dolichocercus [unjustified emendation] (Peracca): Mocquard, 1904:302, 1909:43, 97; Werner, 1929:11. (Elsewhere in Mocquard's 1904 paper, the incorrect spelling *dolischocercus* is found.)

Tropidonotus dolichocercus [sic] (Peracca): Boettger, 1898:25, 1913:312; Boulenger, 1893:246, 1896:607, 1915:373. Boulenger's (1893, 1896) listing of two females in the British Museum under this name are based on misidentified specimens of the then-undescribed and very similar species *Liopholidophis grandidieri* Mocquard (1904) (these specimens are discussed under the species account for *grandidieri*, later). Boulenger listed both *dolichocercus* [sic] and *grandidieri* in the 1915 paper, but his concept of the former seems to have been based on the same misidentified specimens he had cited earlier.

Liopholidophis dolicocercus (Peracca): Parker, 1925: 392.

Liopholidophis sexlineatus (Günther), part: Guibé, 1958:216; Brygoo, 1983:39 (footnote 29) (*Dromicus dolichocercus* [sic] Peracca listed as synonym).

Holotype (Fig. 13). Museo Regionale di Scienze Naturali, Torino (MZUT) 796, a male in fair condition (probably subadult based on size), 427 mm total length, 162

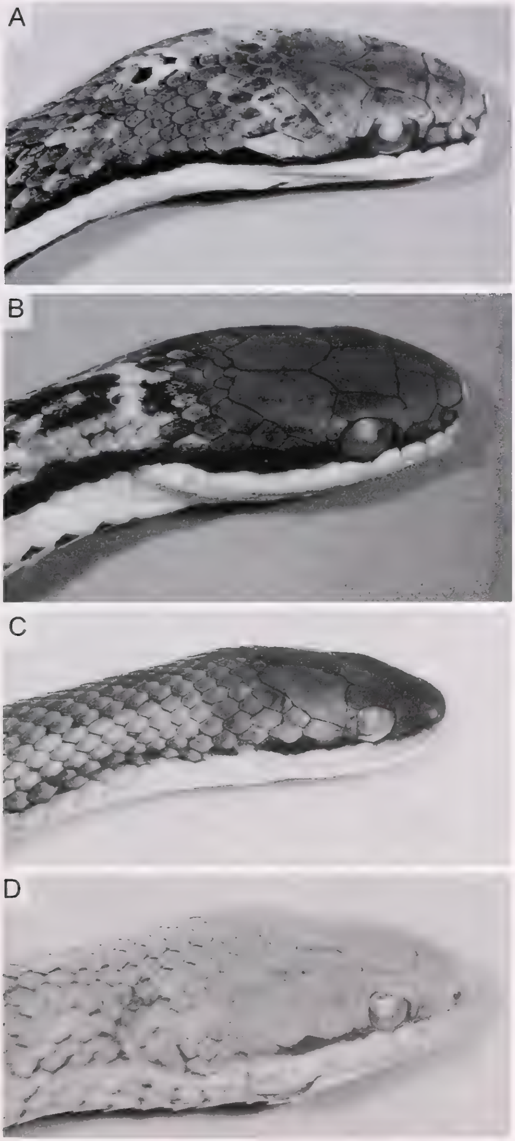

Figure 12. Heads of four species of the *Liopholidophis sexlineatus* group, in dorsolateral view (see also Figs. 2 and 19 for *L. rhadinaea* and *L. grandidieri*, respectively). A. *L. dolicocercus* (Peracca) (MCZ 180405). B. *L. grandidieri* Mocquard (BMNH 95.7.4.32). C. *L. sexlineatus* (Günther) (MCZ 180331). D. *L. pinguis* Parker (USNM 149242).

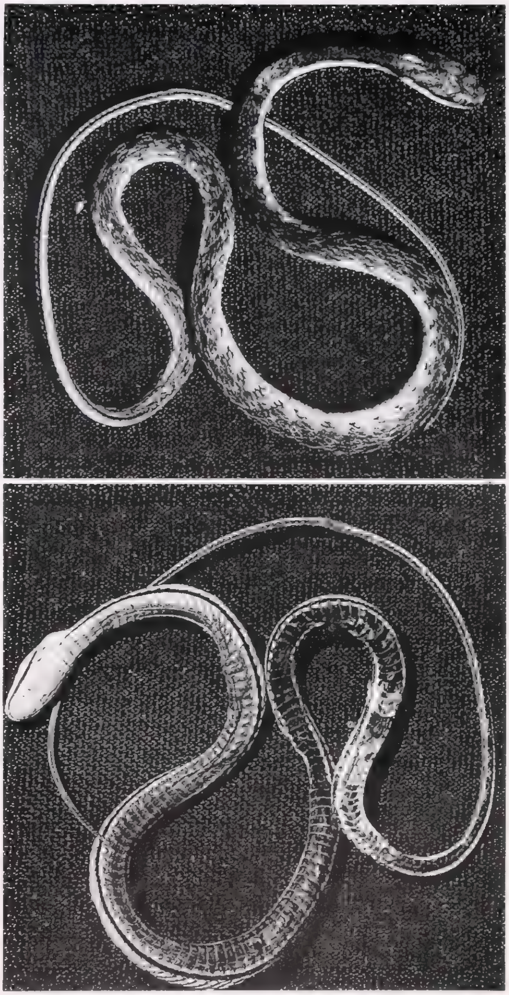

Figure 13. *Liopholidophis dolicocercus* (Peracca), dorsal and ventral views of the male holotype (MZUT 796). Photographs by Dr. Franco Andreone.

mm tail length (38% of total length), with 160 ventrals and 164 subcaudals (Peracca, 1892; see "Remarks" concerning subcaudals). I examined color transparencies of the type, including details of head and body. Peracca's (1892) description of the type is excellent.

Diagnosis. A species of *Liopholidophis* having 17–17–15 dorsal scale rows; tail 39–44% total length and 140–164 subcaudals in males; and a black venter with a marginal white stripe, a black stripe at the suture between the ventral plates and dorsal row 1, but no lateral stripe involving rows 2–3.

Liopholidophis dolicocercus differs from *sexlineatus*, where it has been synony-

TABLE 1. VARIATION IN MENSURAL AND MERISTIC CHARACTERISTICS OF SPECIES OF THE *LIOPHOLIDOPHIS SEXLINEATUS* GROUP. SCALE COUNTS AND BODY PROPORTIONS ARE $\bar{x}$ ± SD (SAMPLE SIZE) WITH RANGES BELOW IN PARENTHESES; MAXILLARY TOOTH COUNTS ARE PREFANG COUNT RANGES (+2 FANGS), FOLLOWED BY $\bar{x}$ ± SD (SAMPLE SIZE). TABULATIONS FOR *DOLICOCERCUS* AND *PINGUIS* INCLUDE DATA ON THE HOLOTYPES FROM PERACCA (1892) AND PARKER (1925), RESPECTIVELY.

	rhadinaea	*dolicocercus*	*grandidieri*	*sexlineatus*	*pinguis*
Dorsals	17–17–15	17–17–15	17–17–15	17–17–15	17–17–15
Ventrals					
Males	174.4 ± 3.64 (7) (170–179)	156.2 ± 2.86 (5) (152–160)	170.0 ± 1.41 (2) (169–171)	153.4 ± 4.01 (15) (147–163)	150.8 ± 2.93 (6) (147–154)
Females	156.3 ± 2.77 (11) (150–160)	146.0 ± 3.16 (4) (143–150)	154.0 ± 9.9 (2) (147–161)	145.1 ± 2.02 (14) (141–148)	142.4 ± 3.43 (5) (139–147)
Subcaudals					
Males	130.67 ± 4.72 (6) (126–137)	155.2 ± 10.47 (5) (140–164)	218.0 ± 4.24 (2) (215–221)	150.0 ± 9.81 (11) (127–160)	93.7 ± 4.37 (6) (88–99)
Females	74.4 ± 5.20 (11) (69–88)	85.0 ± 2.94 (4) (81–88)	— (2) (98^+–113)	73.7 ± 3.27 (14) (67–79)	69.0 ± 2.83 (2) (67–71)
Maximum length (mm)					
Total (SVL)					
Males	749 (429)	928 (517)	1,636 (732)	1,338 (675)	890 (590)
Females	424 (309)	992 (705)	674 (436)	649 (475)	664+ (578)
Tail length/total					
Males	0.41 ± 0.02 (6) (0.37–0.43)	0.41 ± 0.026 (5) (0.38–0.44)	0.55 ± 0.007 (2) (0.54–0.55)	0.47 ± 0.032 (12) (0.41–0.51)	0.33 ± 0.01 (6) 0.30–0.34
Females	0.26 ± 0.01 (11) (0.24–0.28)	0.29 ± 0.005 (3) (0.29–0.30)	0.35 ± 0.0 (2) (0.35)	0.28 ± 0.015 (13) (0.24–0.30)	0.26 ± 0.01 (2) 0.25–0.26
Maxillary teeth	22 + 2—28 + 2 23.9 ± 2 (16)	19 + 2—21 + 2 19.9 + 2 (8)	20 + 2—23 + 2 21.5 + 2 (4)	17 + 2—28 + 2 23.7 + 2 (28)	20 + 2—24 + 2 21.7 + 2 (9)
Eye diameter/Eye–nostril distance	1.19 ± 0.12 1.05–1.45 (13)	1.12 ± 0.10 0.96–1.25 (6)	1.25 ± 0.11 1.16–1.38 (3)	1.10 ± 0.16 0.94–1.44 (16)	0.88 ± 0.06 0.77–0.94 (5)

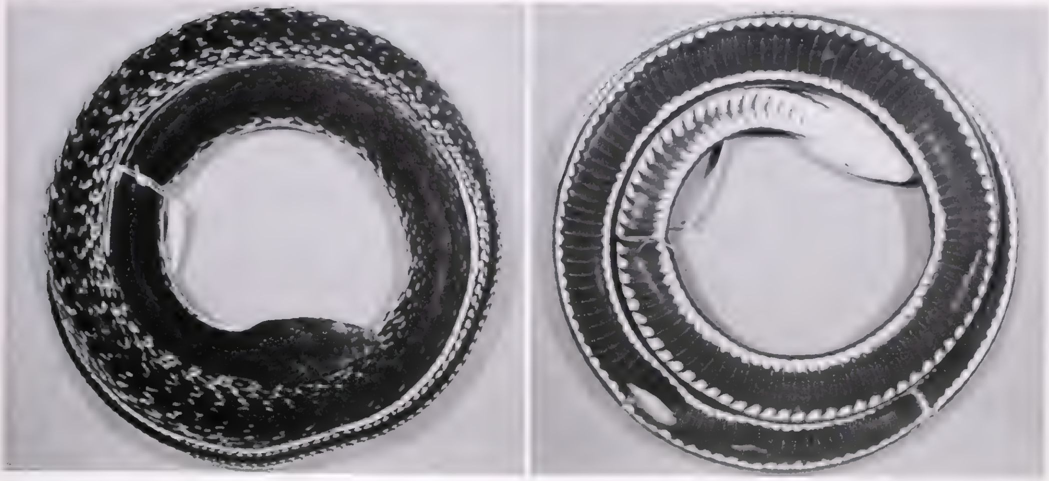

Figure 14. *Liopholidophis dolicocercus* (Peracca) from the RNP. Left: MCZ 180403 (female) in dorsal view. Right: Same specimen in ventral view showing the distinctive ventral pattern. The general dorsal suffusion with black pigment seen in this specimen was observed in several females.

mized (Guibé, 1958), in lacking a black stripe on dorsal rows 2–3 (present in *sexlineatus*, subject to some variation; see species account) and in the distinctive uniformly black venter with white ventrolateral stripes (never uniformly black or with white ventrolateral stripes in *sexlineatus*). Species of the *stumpffi* group have 19 scale rows at midbody.

Liopholidophis dolicocercus is most easily confused with *L. grandidieri* but differs from *grandidieri* in having fewer subcaudal scales (140–164 vs. 215–221, respectively, in males; 81–88 vs. more than 100 [98$^+$–113], respectively, in females) and correspondingly shorter tail (Table 1). The two species also differ in ventral and dorsal patterns. In *Liopholidophis dolicocercus* (Figs. 13–14), the central ⅔ of each ventral scale is solid black, bordered on either side by a large squarish white dot near the lateral edges of the ventral scales. The white dots of successive scales align to form a regular white stripe on either side of the venter from the anterior portion of the body to the tail tip, thus giving *dolicocercus* a highly distinctive, unusual ventral pattern (Fig. 14). Lateral to the ventral white stripes, a bold black line with regular edges occupies the extreme lateral edges of the ventral scales and the lower half of dorsal row 1; these stripes begin just behind the jaw angle, are briefly interrupted at the vent, and continue to the tail tip at the junction of the subcaudals and first dorsal caudal scale row. Thus, the venter in *L. dolicocercus* appears black but bordered on either side by paired white and black stripes (Fig. 14). *Liopholidophis dolicocercus* lacks a lateral black stripe on dorsal rows 2 + 3. In *L. grandidieri* (Figs. 18, 20), the entire venter is black except where broken anteriorly and posteriorly by light pigment (no white stripe at lateral edges of ventrals); there is no discrete black stripe on lateral edges of ventrals and lower ½ of dorsal row 1; and *grandidieri* has a black stripe on rows 2 + 3 (discrete on at least the posterior ⅓ of the body [usually more] and anteriorly as well).

Distribution. Definitely known from the type locality, Andrangoloaka (see "Remarks"), from the RNP, and from Moramanga (Boettger, 1898:25, 1913:312; Appendix). All are middle-elevation localities on the central part of the eastern escarpment (Fig. 3). Within the RNP, *Liopholidophis dolicocercus* has been found at

Talatakely and Miaranony and from approximately 800–1,050 m elevation.

Description. The following description is based on examination of eight specimens and color slides of the holotype. Measurements, proportions, and scutellation are summarized in Table 1. Dorsal scales smooth, lacking apical pits, in 17–17–15 rows. Scale reduction by fusion of rows 3 + 4 at the level of ventrals 90–101 (N = 7, including both sexes). Anal plate divided. Tail length strongly sexually dimorphic: 38–44% of total length in males, 29–30% in females. Largest specimen a female (MCZ 180408), 992 mm total length, 287 mm tail length; largest male (MCZ 180405) 928 mm total length, 411 mm tail length. Ventrals 156–160 in males, 143–150 in females. Subcaudals 140–164 in males, 81–88 in females. Supralabials 8 with 4–5 touching eye (N = 7; one specimen has 9 with 5–6 touching eye on one side only). Infralabials 9–9 (N = 2), 10–10 (4), or 10–11 (1), the first pair in contact behind the mental, 1–4 or 1–5 touching an anterior genial, 4–5 or 5–6 touching a posterior genial. Anterior genials approximately equal to, or slightly longer or shorter than, posterior genials. Minute scale pits or tubercles visible under high magnification on many head plates.

Rostral visible from above, about 1.5 times wider than high. Paired internasals, each slightly wider than long, 60–70% as long as prefrontals. Paired prefrontals, each wider than long, in contact with each other and with frontal, supraocular, preocular, loreal, postnasal, and internasal. Frontal pentagonal. Loreal squarish, approximately as high as wide, separated from eye by single preocular, which is much taller than wide, and expanded dorsally and ventrally. Two postoculars (three in the holotype *fide* Peracca, 1892). Temporals 1 + 2 + 3.

Body rounded, somewhat stocky in females, tending toward slightly higher than wide and more gracile in males; ventrolateral edge of body slightly angulate (males) to more rounded (females). Head distinctly wider than neck in females, only slightly so in males. Pupil round. Eye approximately equal to or slightly greater than distance between eye and posterior edge of nostril ($\bar{x} = 1.12 \pm 0.1$; range 0.96–1.38; N = 6); approximately 50–60% of snout length.

Dentition. Maxillary teeth 19–21 + 2 (N = 8). Diastema essentially absent; gap ≤1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, twice as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal 20–25%, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. The skull from a prepared skeleton (MCZ 180409, female) has 14–13 (l–r) palatine teeth, 26–27 pterygoid teeth, and 26–27 dentary teeth.

Hemipenis (see Fig. 31). Deeply bilobed, noncapitate, acalyculate (entirely spinose), with a basal stalk nearly half the length of the organ. Sulcus spermaticus deeply bifurcate, centrolineal. The organ is considerably larger, proportionately, than the hemipenis of other members of the *sexlineatus* group.

Coloration in Life. The uniform black venter bordered on either side by a white stripe, and a black stripe on the suture line between the ventrals and dorsal row 1, are highly distinctive (see "Diagnosis"). In contrast, *Liopholidophis dolicocercus* is somewhat variable in dorsal coloration, even within the RNP series. Anteriorly, the dorsum tends to be a more or less uniform brown to yellowish brown (Fig. 15) but usually has indistinct darker markings or reticulations (Fig. 16), or general suffusion of black (Fig. 14). Posteriorly, the dorsal coloration tends to be disrupted into a light brown or yellowish brown ground color, with complex black or dark brown blotches or mottling. In some specimens, the posterior mottling takes the form of vague chevrons; in others, it tends to form offset middorsal irregular spots, with irregular markings laterally (Figs. 15, 17). In two females (MCZ 180403 and 180408), the

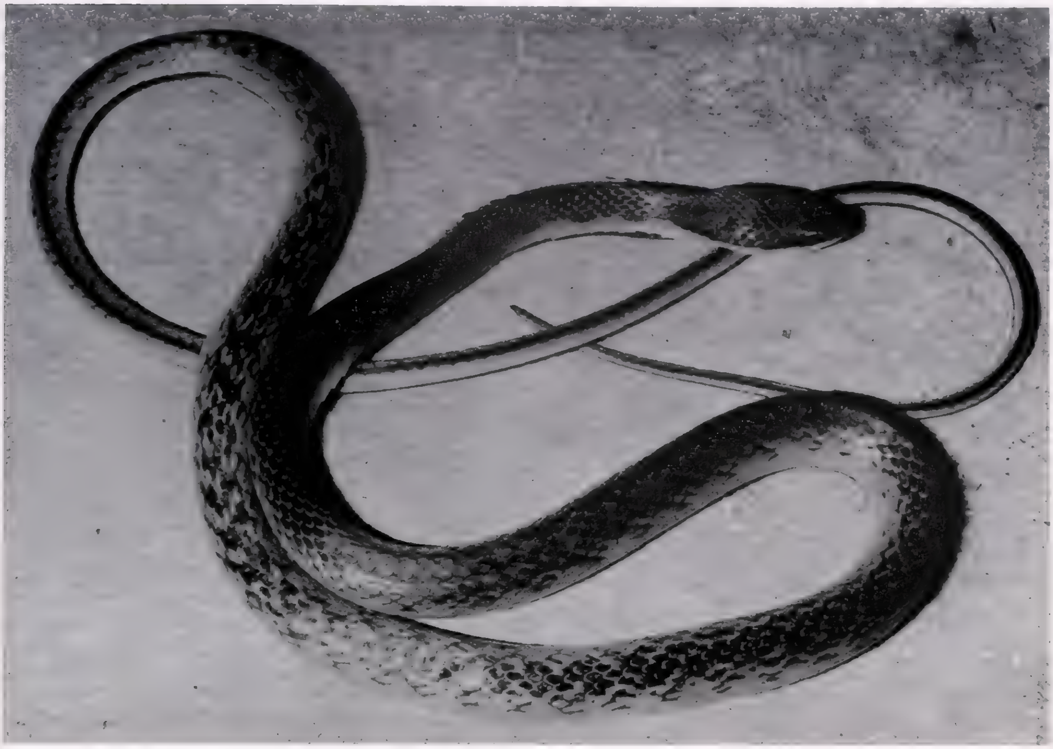

Figure 15. *Liopholidophis dolicocercus* (Peracca), a male (MCZ 180407) from the RNP. The chevron-shaped blotches on the posterior dorsum are characteristic of many males (see text).

dorsum has a general suffusion of black pigment (Fig. 14), obscuring the pattern except for occasional light areas on individual scales. The general dorsal color tones are lighter, and pattern more evident, in four males than in four females.

Color notes from life for MCZ 180403 (female) are as follows: Middorsum black. Flanks mottled with black and tan/yellowish brown (yellowish on rows 1–3 anteriorly, 1–5 posteriorly). Top of head posterior to eyes black; anterior to eyes mottled with black and yellowish brown. Upper labials yellowish cream. Lower labials and throat creamy white. Pupil round, iris brown. Ventral pattern: large central area of each ventral scale black, with lateral creamy white border; black stripe on extreme outer edge of each ventral and ventral ½ of scale row 1. Overall, the venter appears black with a creamy white stripe and a black stripe down either side. Ventral surface of tail patterned similarly. Lateral portion of tail tan to yellowish brown.

Coloration in Preservative. Top of head down to upper edge of supralabials brown, usually suffused or irregularly spotted with black. Upper edge of supralabials and adjacent dorsal head scales with dense black pigment, forming distinct narrow stripe posterior to eye covering lower postocular, lower portion of temporal scales, and up to ½ of last 2 supralabials; stripe continuing onto anterior body on scale row 4 (dropping to 3 shortly behind head) and becoming discontinuous at level of ventrals 5–10. Other than dorsally bordering black pigment and light brown suffusion anteriorly and/or dorsally, supralabials are immaculate creamy white. Infralabials, mental, gulars, and preventrals immaculate cream-colored.

Anterior dorsum except for lower 3 dorsal rows usually with suffusion of black, especially in females, in which black may be the dominant pigment (one female, MCZ 180403, is entirely black anteriorly). Postocular black stripe continues on anterior body as a black line on row 4 immediately behind head, dropping to row 3, continuing as a series of irregular dashes along suture between rows 3 and 4 for virtually entire length of body (posteriorly often not discretely separate from general dorsal mottling). Posteriorly, dorsal brown coloration breaks up, at first by lightening of pigment on more lateral dorsal scale rows, then on medial rows. The general effect for most individuals is a more or less unicolor anterior dorsum and a more mottled posterior. With breakup of dorsal color, black pigment retained along lateral scale sutures, forming irregular reticulations.

Venter black, bordered at lateral edges of ventrals by discrete cream stripe and, along suture between ventral scutes and first dorsal row, a regular narrow black stripe (covering about ½, or slightly more, of first dorsal row) (Fig. 14). In the RNP sample, the edges of the ventrolateral cream stripe are very regular; in the only non-RNP specimen examined (SMF 17575), the medial edges of the stripe are jagged, as they appear to be in the holotype from the same region (Fig. 13). Ventral surface of tail with median black stripe bordered laterally by cream stripes (Fig. 14).

Natural History. Liopholidophis dolicocercus is diurnal and terrestrial. The species was infrequently encountered in the RNP (seven specimens). All were found in relatively undisturbed forest on the trail system at Talatakely, except for one collected in primary montane rainforest at Miaranony. Specimens were obtained November to January between 0900 and 1530 hr.

A large female collected 2 January 1993 at 1300 hr on the ground by a trail made no attempt to bite, nor even to resist capture. Several specimens collected by me personally were very slow, almost lethargic, snakes upon capture. Two specimens collected by others were reported to bite, and one was said to be fast-moving.

One specimen of *Liopholidophis dolicocercus* contained food: MCZ 180407 (SVL 514 mm) contained one *Plethodontohyla alluaudi,* a small terrestrial (leaf-litter) microhylid frog, swallowed tail first.

Three females in the RNP sample were gravid. MCZ 180403 (SVL 543 mm), collected 15 November, contained five large, yolked, nonoviductal eggs. MCZ 180404 (SVL 634 mm) and MCZ 180408 (SVL 705 mm), collected 10 December and 2 January, contained five and seven shelled eggs, respectively; no embryo was detected in an egg removed from each of these specimens. Based solely on the presence of shelled oviductal eggs, *Liopholidophis dolicocercus* is assumed to be oviparous (but see Blackburn, 1993, for cautionary notes).

Remarks. Peracca's (1892) description of *Liopholidophis dolicocercus* is incomparably good for the period, its only limitation being that it was based only on the male holotype. The collector of the type is not registered in the collection ledgers of the Torino museum (Elter, 1981; verified from photocopies of the catalog pages, which list Peracca as the donor). Peracca stated that the collection from which the type of *dolicocercus* came "was donated to the zoological museum of Torino" (Peracca, 1892:5) and, later, for the same collection "a rich collection of reptiles and amphibians from Madagascar arriving at the beginning of the current year . . . comes from the environs of Andrangoloka [=Andrangoloaka] and from the nearby Umbi valley" (Peracca, 1893:5). Several Madagascan reptiles in the Torino collection were donated by a [Giuseppe] Pittarelli (Elter, 1981). Pittarelli lived in Moramanga, a town in the vicinity of Andrangoloaka, around the turn of the century, and also collected invertebrates for the Torino museum (Nobili, 1905). Peracca possibly

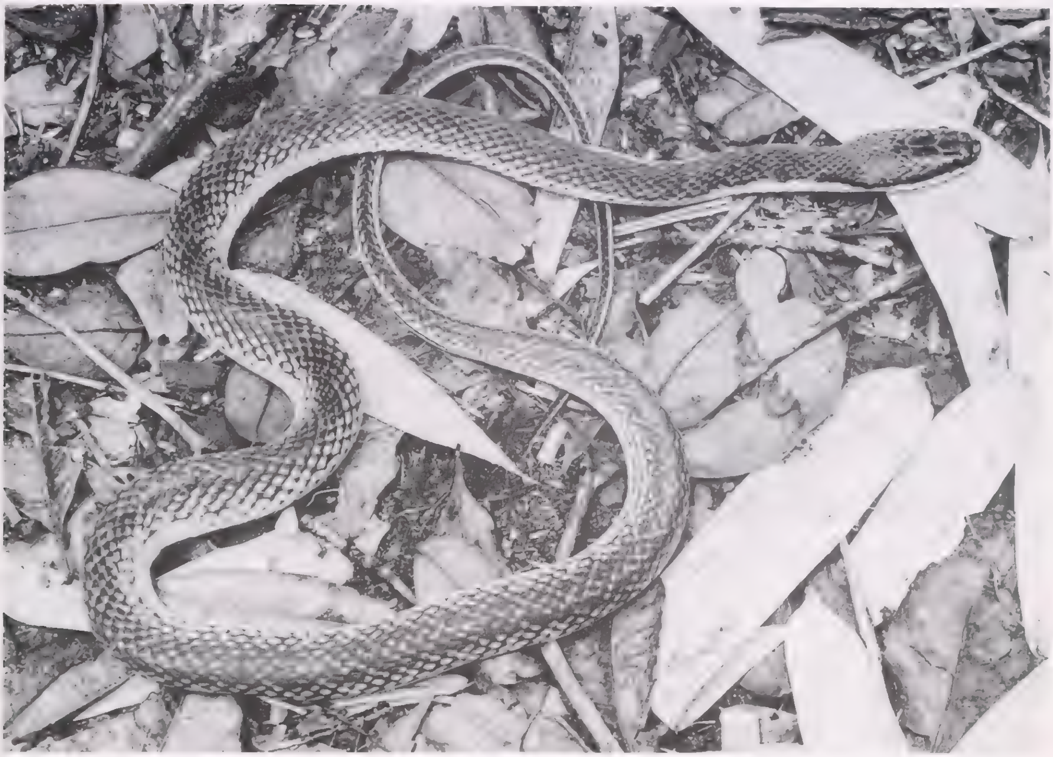

Figure 16. *Liopholidophis dolicocercus* (Peracca), a female (MCZ 180408) from the RNP. In females, the dorsum is often suffused with black pigment or forms a network, as in this specimen, and discrete blotches are usually difficult to discern (cf. Figures 14–15).

obtained Madagascan specimens, including the type of *dolicocercus*, from him.

According to Charles P. Blanc (in litt.; see also Glaw and Vences, 1994:471), who visited the type locality many years ago, Andrangoloaka was on the eastern side of Lake Mantasoa at 1,386 m elevation (47°55′E, 19°02′S, and therefore not "near Manjakandriana," a town well to the northwest of Lake Mantasoa, as reported by Blommers-Schlosser and Blanc, 1991: e.g., p. 233).[6] Originally dense rainforest, the site has been logged and is now submerged as a result of dam construction. "Umbi" is probably a transliteration of the Malagasy word *Ombi* ("cow"). Neither

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[6] Carleton and Schmidt (1990:11; as "Andrangolaoka"), apparently following MacPhee (1987:38; as "Moramanga; Andrangoloaka"), gave the elevation as 950 m, the approximate elevation of Moramanga. But Andrangoloaka itself is farther west and at a higher elevation. Grandidier (1893:accompanying map "Nord-est") gave 1,410 m for Andrangoloaka, closer to Blanc's estimate. Some confusion about coordinates for this locality and others might be engendered by comparison of recent sources with older French sources. For example, Grandidier (1893:295) gave slightly different coordinates for Andrangoloaka than given by the Defense Mapping Agency (1989). The confusion is resolved by realization that French works around the turn of the century commonly used a coordinate system based on the Paris meridian, rather than the Greenwich meridian, as in common use today.

The variant spellings "Andrangoloka," "Andrangolaoka," and "Andrangoloaka" for this locality are commonly seen. "Andrangoloaka" seems to be more consistently used in "period" works (e.g., Grandidier, 1893; Ahl, 1928) and is commonly found in compendia today (e.g., Defense Mapping Agency, 1989; Blommers-Schlösser and Blanc, 1991; Glaw and Vences, 1994).

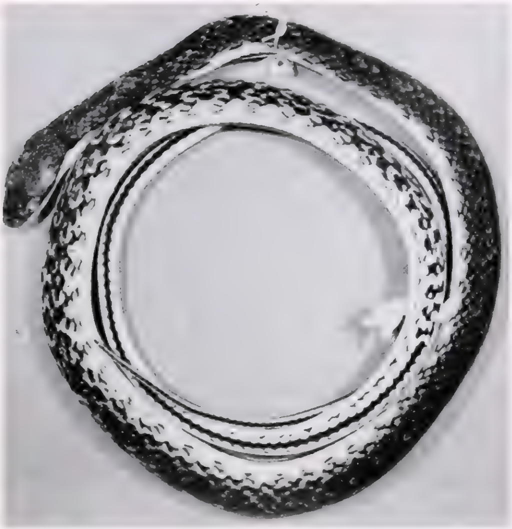

Figure 17. *Liopholidophis dolicocercus* (Peracca) from the RNP. MCZ 180407 (male).

Blanc nor I succeeded in finding the "Ombi River" on maps or in gazetteers.

Few specimens of *dolicocercus* seem to have been obtained since its description. Other than the RNP series, I am aware only of the type (Peracca, 1892) and a specimen obtained by Boettger (1898, 1913; Appendix). Boulenger (1893, 1896) referred two females in the BMNH to *L. dolicocercus*, but these are actually the very similar species, *L. grandidieri* (discussed later). *Liopholidophis dolicocercus* was recognized as a distinctive valid species by various workers from the time of its description (e.g., Mocquard, 1904, 1909; Boulenger, 1893, 1896, 1915; Boettger, 1898, 1913; Parker, 1925; Werner, 1929) but appears not to have been mentioned in the literature between Werner's (1929) listing in a checklist and Guibé's (1958) placing it in the synonymy of *L. sexlineatus* (see also Brygoo, 1983). However, *Liopholidophis dolicocercus* bears little resemblance to *L. sexlineatus* in coloration or pattern, which is apparent from a reading of Peracca's (1892) description, and it differs from *sexlineatus* in body proportions, habitus, hemipenial morphology (see below), and macrohabitat association. Scale counts in the two species are similar (Table 1), which probably led Guibé to synonymize them. Because of substantive differences of coloration, pattern, hemipenial morphology, and body proportions, I resurrect *Liopholidophis dolicocercus* from the synonymy of *Liopholidophis sexlineatus*. As Peracca's description of the type of *dolicocercus* is unusually complete, I did not examine the holotype directly but did study a series of color transparencies of it (including the head, dorsum, and venter; cf. Fig. 13). The RNP series unquestionably conforms to Peracca's (1892) *dolicocercus*.

An apparent author's or printer's correction to the description of *Liopholidophis dolicocercus* requires comment. A reprint of Peracca's article in the MCZ herpetology department library, and the bound journal copy in the Museum of Comparative Zoology (Ernst Mayr) Library, have the subcaudal count in the description (Peracca, 1892:2) scratched through in ink and "corrected" by hand to 164 (original printed figure apparently "329"). The handwriting of the correction in both sources is identical and in a rather archaic script. I subsequently checked another copy of the journal in the library at the Marine Biological Laboratory, Woods Hole; the same correction in the identical handwriting was found. I infer that these sources were corrected either by Peracca himself or at his or the printer's direction. Similar corrections were made in all three sources for the description of *Tachymenis boulengerii* in the same paper.

The ventral black coloration of *Liopholidophis dolicocercus* possibly develops ontogenetically, although no small subadults from the RNP are available to be certain. Ontogenetic development is suggested by the ventral pattern in the male holotype, which, at 427 mm total length (265 mm SVL; Peracca, 1892), is about ½ the length of any other male *dolicocercus* examined (observations from magnification of color transparencies of the type). In the type, only the posterior ½ of the venter is solid black; anteriorly, the black pigment is broken up (increasingly, posterior to anterior) so that the anterior ventral scutes have, at most, a central region heavily stippled with black, yielding a grayish overall appearance. If this interpretation is correct, small juveniles of *dolicocercus* possibly have immaculate, or only posteriorly darkened, venters. Given the similarity in the ventral patterns of *dolicocercus* and *grandidieri*, the last species possibly also undergoes a similar ontogenetic transformation.

Liopholidophis dolicocercus is the only species of the *sexlineatus* group for which males do not appear to attain greater total lengths or SVLs than females (Table 1), but this probably reflects the small sample size of males for this species.

Liopholidophis grandidieri Mocquard
Figures 12, 18–20

Tropidonotus [*Dromicus*] *dolichocercus* [sic] (not of Peracca, 1892): Boulenger, 1893:246–247, 1896:607, specimens a and b (misidentification; further discussed later).

Liopholidophis grandidieri Mocquard, 1904:304. (Type locality, "l'embouchure du Saint-Augustin" [mouth of the Saint-Augustin River"], in error). Holotype, MNHN 02-103 [examined] (Figs. 18–19). Boettger, 1913:372; Parker, 1925:392; Werner, 1929: 11; Guibé, 1958:217–218; Brygoo, 1983:55, 1987: 24; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992:266, 1994:338; Nicoll and Langrand, 1989:130.

Tropidonotus grandidieri (Mocquard): Boulenger, 1915:373.

Holotype. MNHN 02-103 (Figs. 18–19), an adult male in fair condition; 1,636 mm total length, 904 mm tail length (55% of total length), 171 ventrals, 221 subcaudals, divided anal plate, 22 + 2 maxillary teeth.

Diagnosis. A species of *Liopholidophis* characterized by more than 200 subcaudals in males, more than 100 subcaudals in females; tail >50% of total length in males (35% in females); venter (except for anterior ventral plates) entirely black, including the anal plate, and not bordered by a marginal white stripe; lateral black stripe on dorsal rows 2–4 anteriorly and 2–3 posteriorly, but dark dorsal stripes otherwise lacking. These features distinguish *Liopholidophis grandidieri* from all species of *Liopholidophis*, none of which have such proportionally long tails; all species but *dolicocercus* have dorsal stripes (light or dark) on scale rows other than 2 + 3. *Liopholidophis grandidieri* is most easily confused with *L. dolicocercus*; distinguishing features are given in the account for that species.

Distribution (Fig. 3). Known definitely from the RNP (Mt. Maharira) and from Ambohimitombo Forest, a locality well known from specimens collected by Forsyth Major (e.g., Boulenger, 1896; Major, 1896). The type locality, "l'embouchure du Saint-Augustin" (mouth of the Saint-Augustin River), is in the arid southwestern sector of the country (23°33′S, 43°46′E; Fig. 3) and almost certainly in error. All other specimens are from the eastern rainforest belt (Appendix). The type of *grandidieri* was the only specimen recognized until recently. The two documented localities are approximately 70 km apart in the central part of the eastern escarpment (Fig. 3).

The descriptor "eastern Imerina" (locality for BMNH 95.10.29.52) refers to the territory on the eastern edge of the escarpment between approximately parallels 18° and 21°, the Imerina being one of the indigenous peoples of the central plateau (see, e.g., Gallieni, 1908:pl. 6). I have tried, without success, to verify the documentation and localities for the records listed by the UICN/PNUE/WWF (1990: 223) as "three new specimens from the eastern forests."

The single specimen from the RNP was collected near the highest point in the park, 1,375 m (Mt. Maharira; see later). BMNH 95.7.4.32 is from Ambohimitombo Forest, presumably near the town of that name, which is at approximately 1,200 m elevation.

Description. The following description is based on examinaton of two males (including the holotype) and two females. Measurements, proportions, and scutellation are summarized in Table 1. Largest specimen the male holotype, 1,636 mm total length, 904 mm tail length; largest female (BMNH 95.7.4.32) 674 mm total length, 238 mm tail length. Tail length strongly sexually dimorphic, 54–55% of total length in males, 34–35% in females (Figs. 18, 20). Dorsal scales smooth, lacking apical pits, in 17–17–15 rows. Scale row reduction from 17 to 15 rows by fusion of rows 3 + 4 at the level of ventrals 92–112 (N = 3). Ventrals 169–171 in males, 147–161 in females. Anal plate divided. Subcaudals 215–221 in males, 113 in female with complete tail (98^+ in female with incomplete tail). Eight upper labials with 4–5 touching eye; 9 lower labials, the first pair in contact behind the mental, 1–4 touching an anterior genial, 4–5 touching a posterior genial. Anterior genials shorter than posterior genials. Two postoculars; temporals 1 + 2.

Body slightly higher than wide; ventrolateral edge of body angulate. Head slightly wider than neck. Pupil round. Eye relatively large, its diameter greater than distance between eye and posterior edge of nostril ($\bar{x} = 1.25 \pm 0.1$; range 1.16–1.38; N = 3), its diameter 60–65% of the distance from anterior edge of eye to tip of snout. Scattered minute pits and tubercles appear to be present on the anterior head plates.

Dentition. Maxillary teeth 20–23 + 2 (N = 4). Diastema short or absent, one tooth width or less. The ungrooved fangs are less than twice as large as the posteriormost maxillary teeth, have a flattened knifelike posterior surface, and have a rounded anterior surface except for the distal tip, which is slightly compressed and has a short cutting edge. The fangs are essentially in line with the prefang teeth (i.e., not offset). A prepared skull (MCZ 180297, male) has 20–23 maxillary teeth, 16–18 palatine teeth, 25–29 pterygoid teeth, and 30 right dentary teeth (left damaged); the diastema in this specimen is about the width of the preceding teeth, and the fangs are not offset.

Hemipenis (Fig. 32). Deeply bilobed, noncapitate, acalyculate (entirely spinose), with a basal stalk comprising slightly less than ½ the length of the organ. Sulcus spermaticus deeply bifurcate, centrolineal.

Coloration in Life. I have not seen *Liopholidophis grandidieri* in life. However, given the overall exceedingly similar patterns of *grandidieri* and *dolicocercus,* I suspect that the two species have similar coloration in life (see species account for *dolicocercus*).

Coloration in Preservative (MCZ 180297). The specimen is perhaps somewhat excessively darkened as a preservation artifact; its pattern is less distinct than that of the holotype. Anteriorly, a middorsal series of irregular blotches or paired spots, separated by whitish interspaces. The dorsum rather abruptly darkens shortly after the neck region, and most of the dorsum appears blackish. Many dorsal scales of all rows except the first have distinctly white borders; these are more evident anteriorly, posteriorly becoming obscured by increasing black pigment. An indistinct brownish streak is present on the flanks, and a brownish gray streak on scale rows 1–2. Black lateral stripe continuous with postocular stripe, on rows 3–5 immediately behind head, soon dropping to rows 2–4 for much of the body, and to adjacent portions of rows 2–3 posteriorly; the lateral stripe is indistinct and disrupted anteriorly, but very distinct, continuous, and with regular borders posteriorly. Throat and several anterior ventrals white, but remainder of venter and lower part of scale row 1 solid black; anal plates black. Top of head brownish; black postocular stripe continuous with lateral black stripe. Some black pigment on upper edges of supralabials, preoculars, loreals, nasals, and rostral; supralabials, infralabials, and gular region otherwise white. Tail with a middorsal, midventral, and a pair of ventrolateral black stripes (at border between subcaudals and dorsal caudal scales); the midventral stripe becomes thinned and broken toward the tip, but stripes otherwise continue to the tip. Subcaudals otherwise white; dorsal caudals otherwise brownish.

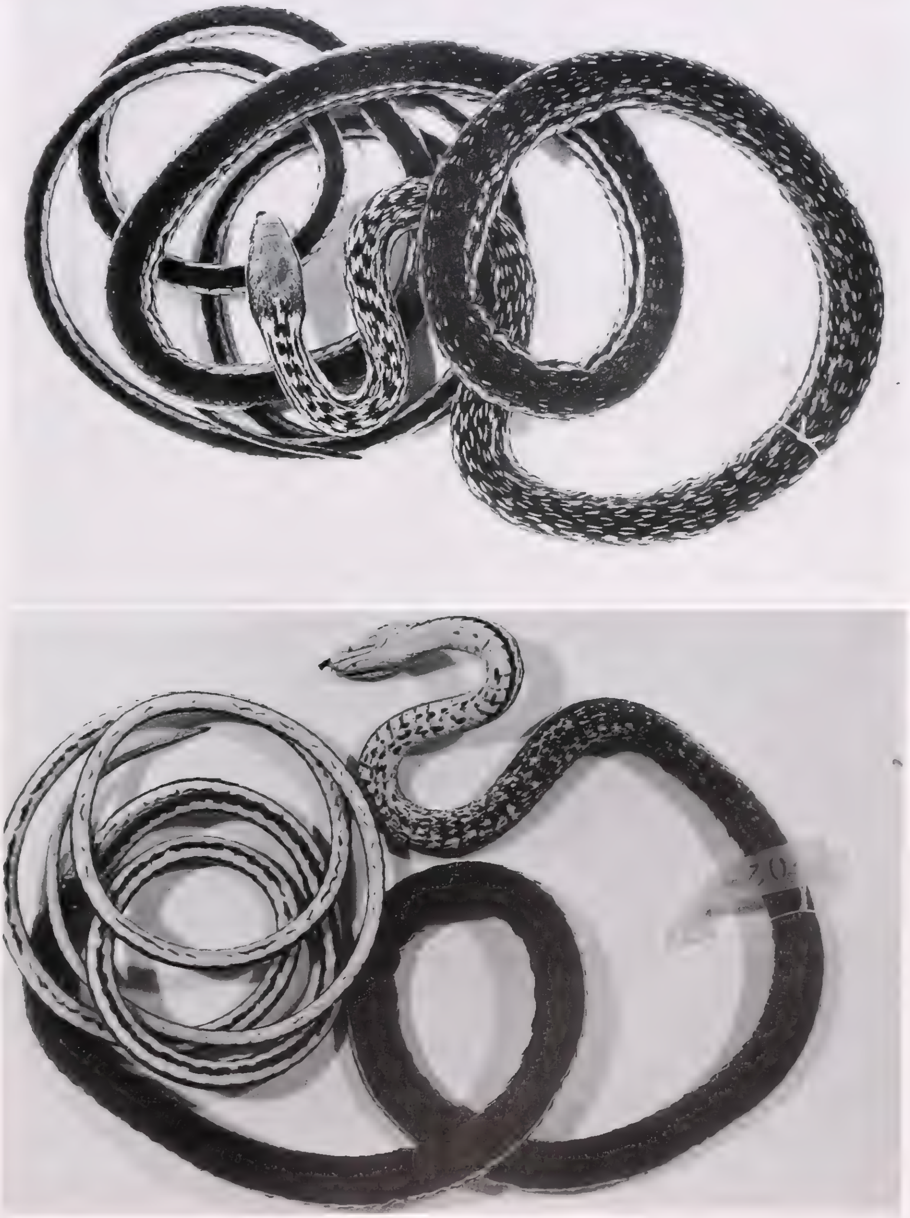

Figure 18. *Liopholidophis grandidieri* Mocquard, dorsal and ventral views of the male holotype (MNHN 02-103).

The two BMNH females (Fig. 20) and the holotype (Figs. 18–19) of *grandidieri* are similar to MCZ 180297, except in having somewhat more distinct lateral stripes and in tending to have the black ventral coloration broken up somewhat more anteriorly and posteriorly. Many of the dorsal scales of these specimens also have vivid white borders, as in MCZ 180297. The black stripe on the subcaudal scales is

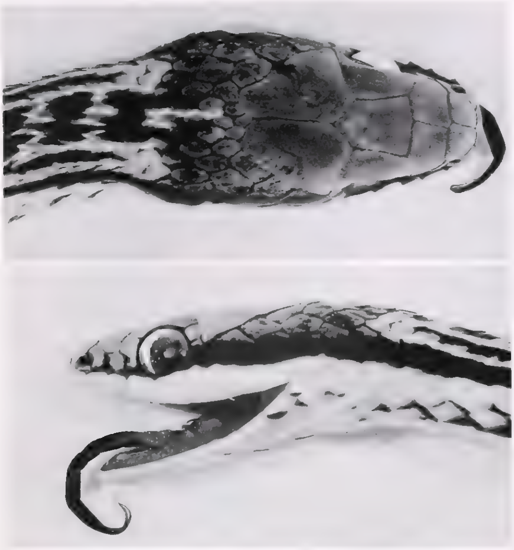

Figure 19. *Liopholidophis grandidieri* Mocquard, dorsal and lateral views of the head of the holotype (MNHN 02-103).

somewhat variable, being more or less continuous to the tail tip (MCZ 180297), essentially absent (BMNH 95.7.4.32, 95.10.29.52; a few blackened suture lines) or continuous anteriorly but absent posteriorly (MNHN 02-103).

Natural History. The RNP specimen was collected 13 April 1992 during the day near the summit of Mt. Maharira, a granitic massif with expanses of bare rock, grassy areas, and low scrubby forest (probably resulting from thin soil over bedrock).

Two females, BMNH 95.7.4.32 (SVL 436 mm) and 95.10.29.52 (SVL 412 mm), have large oviductal eggs (five and four, respectively, as ascertained by palping) covered by a thickened leathery shell. BMNH 95.7.4.32 was obtained at Ambohimitombo by Forsyth Major, who collected there 12–24 January 1895 (Carleton and Schmidt, 1990:table 1). One egg from BMNH 95.7.4.32 contained an embryo in Zehr (1962) stage approximately 23–24. The relatively advanced embryo surrounded by a leathery shell suggests oviparity in *grandidieri* according to criteria outlined by Blackburn (1993).

Remarks. Liopholidophis grandidieri was described along with a heterogeneous assortment of amphibians and reptiles from Africa and South America (Mocquard, 1904), and neither a collector nor donor of the type was stated. The only other Malagasy species described in the same paper, *Pseudoxyrhopus dubius* (=*tritaeniatus*; cf. Raxworthy and Nussbaum, 1994), was said to have been "sent to the [Paris] Museum, without indication of locality, by M. Rousson, explorer" (Mocquard, 1904:306). *Liopholidophis grandidieri* was described during a period of accelerated French expansion and exploration in Madagascar (Gallieni, 1908), and the type may have been obtained by any number of French political administrators, explorers, or medical or military personnel on the island at the time.[7] The type locality, Saint Augustine Bay, was a major port and shipping point during the period (see, e.g., Bastard, 1898), and the type was probably sent to Paris with the "locality" recorded as the shipping point.

Two females of *Liopholidophis grandidieri* were erroneously referred to *L. dolicocercus* by Boulenger (1893:246–247, 1896:607): BMNH 95.10.29.52, collected by the Reverend R. Baron in "East Imerina," and BMNH 95.7.4.32 (Fig. 20), collected by Dr. Forsyth Major in the "Ambohimitombo Forest." That these are the specimens Boulenger had in hand is suggested by the associated collectors, locality data, measurements (for 95.10.29.52), sex, ventral and subcaudal counts, and ventral pattern (described in detail later), as reported by Boulenger (1893, 1896). My

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[7] The Bulletin du Muséum d'Histoire Naturelle during this period contains numerous references to collections received from Madagascar. For example, volume 4 (1898, no. 2, p. 4), includes the following: ". . . the arrival of a crate sent from Tamatave [=Toamasina] by Captain Ardouin and containing some reptiles, diverse arthropods, several molluscs, and two Hova skulls" (the Hova being one of the indigenous peoples). Rarely, it seems, were these notices sufficient in themselves to relate to specific collections or specimens.

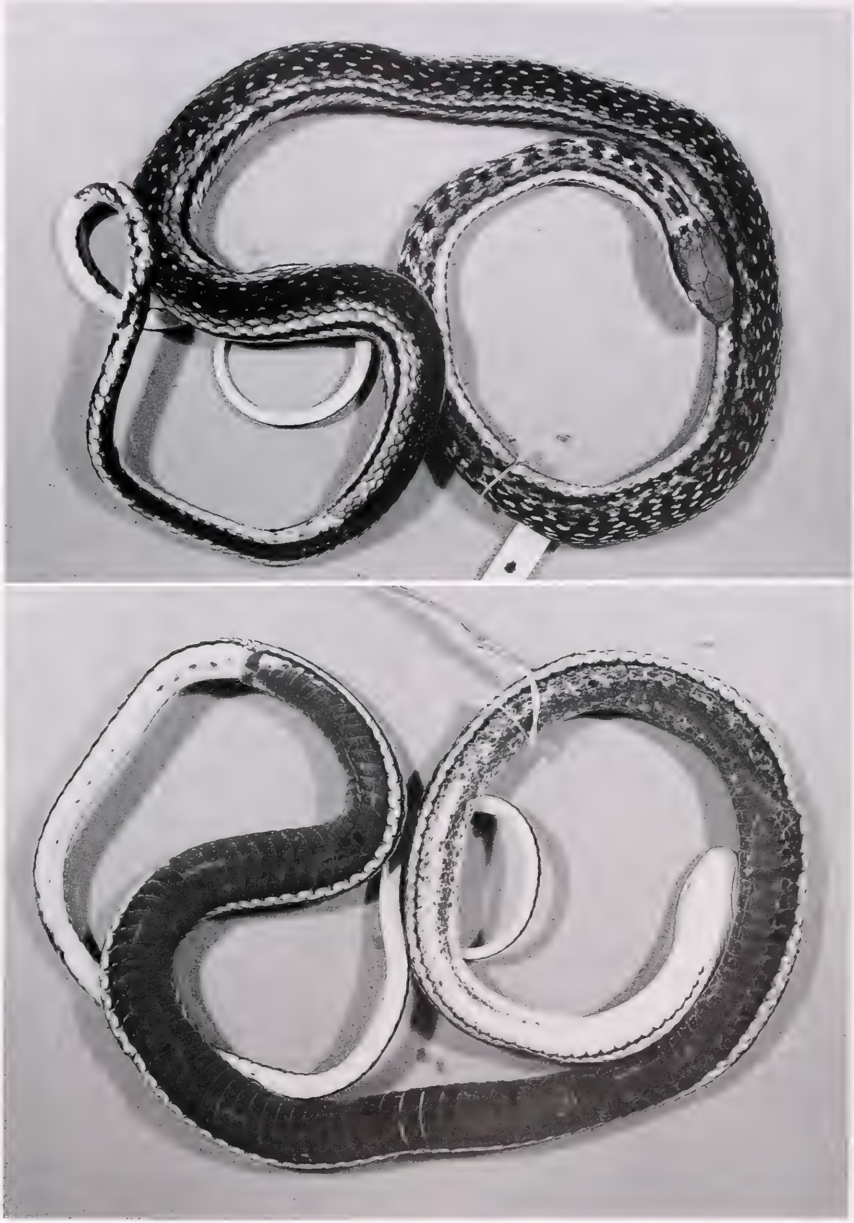

Figure 20. *Liopholidophis grandidieri* Mocquard. Dorsal and ventral views of a female from "Ambohimitombo Forest" (BMNH 95.7.4.32). This specimen was referred to (*Liopholidophis*) *dolicocercus* by Boulenger (1896:607; specimen b).

counts for ventrals and subcaudals differ from Boulenger's by at most two (Table 1), and those differences may be accounted for by a somewhat damaged tail in BMNH 95.7.4.32 and the inclusion of preventrals in the ventral counts given by Boulenger.

Boulenger's erroneous referral of these specimens to *dolicocercus* is understandable in view of the fact that he was comparing two females with the description of the male holotype of *dolicocercus*, in a genus known to exhibit exaggerated sexual dimorphism in subcaudal counts. Boulenger failed to note Peracca's explicit description of one of the diagnostic pattern differences between *dolicocercus* and *grandidieri*: ". . . [in *L. dolicocercus*] a black line . . . runs in part along the margins of the ventrals, in part on the inferior series of the scales of the body. This line is bordered with yellowish white along its *inferior* margin" [i.e., at the lateral edges of the ventral scutes; emphasis added] (Peracca, 1892:2). The two BMNH specimens have the alternative pattern characteristic of *grandidieri, viz.*, an entirely black venter (no white stripes), separated by a light interspace from lateral black stripes on dorsal rows 2 + 3: "belly black, separated from the lateral streak by a yellowish interspace or streak" (Boulenger, 1893:247). Significantly, Boulenger does not mention the two ventral pattern features diagnostic of *dolicocercus* (see "Diagnosis" in the *dolicocercus* account for other differences).

Liopholidophis sexlineatus (Günther)
Figures 12, 21

Dromicus sexlineatus Günther, 1882:264 (Type locality, "Eastern Betsileo"). Syntypes, The Natural History Museum, London (BMNH) 1946.1.13.17–19 [examined].

Dromicus macrocercus Günther, 1882:265 (Type locality, "Eastern Betsileo"). Syntypes, BMNH 1946.1.13.28–30 [.28 not seen]. Peracca, 1892:2. Boulenger, 1893:246 (synonym of *Tropidonotus sexlineatus*). Mocquard, 1909:95 (synonym of *Liopholidophis sexlineatus*).

Leptophis varius Fischer, 1884:36 (Type locality, "Madagascar"). Syntypes, five specimens in the Natural History Museum in Hamburg, nos. 1174–75 *fide* Fischer (1884:38) [not seen].[8] Boulenger, 1893:246 (synonym of *Tropidonotus sexlineatus*). Guibé, 1958:246 (synonym of *Liopholidophis sexlineatus*).

Dromicus dolicocercus Peracca, 1892:1 (Type locality, "Valle dell'Umbi [Andrangoloka]"): Guibé, 1958 (synonym of *Liopholidophis sexlineatus*). Here considered a valid taxon.

Tropidonotus sexlineatus (Günther): Boulenger, 1893: 246, 1896:607, 1915:373. Jourdran, 1903:34.

Liopholidophis sexlineatus (Günther): Mocquard, 1904:303, 305; 1909:43, 95; Boettger, 1913:372; Parker, 1925:392; Werner, 1929:11; Guibé, 1958: 216; Domergue, 1969:19; Brygoo, 1983:55, 1987: 24; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992:266, 1994:338; Nicoll and Langrand, 1989:135.

Syntypes. BMNH 1946.1.13.17–19 (old numbers 82.5.8.3, 82.5.8.2, and 82.5.8.4, respectively), all three adult females obtained by Rev. W. D. Cowan. Scale counts, measurements, and other data for the syntypes are, respectively, as follows: ventrals: 146, 145, 144 (preceded by 1, 2, and 1 preventrals); subcaudals: 74, 73, 77; anal divided; total lengths (mm): 605, 620, 589; tail lengths (mm): 175, 172, 175 (29%, 28%, 30%, respectively, of total length); maxillary teeth: 23 + 2 in each case.

Diagnosis. Liopholidophis sexlineatus is distinguished from members of the *stumpffi* group in having 17–17–15 scale rows (vs. 19–19–17). It differs in details of color pattern from *dolicocercus, grandidieri*, and *rhadinaea*: venter largely solid black, or solid black with marginal white stripe, in *grandidieri* or *dolicocercus*, respectively; whitish to heavily, but irregularly, splotched with black (never solid black) in *sexlineatus*; three light nape spots and dorsolateral light stripe in *rhadinaea* (absent in *sexlineatus*).

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[8] I am blindly following Boulenger (1893) in relegating *varius* to the synonymy of *sexlineatus*, which seems likely for some or all of the syntypes of *varius*. In that case, all of the types would be females or else males with incomplete tails, given their subcaudal counts and relative tail proportions (Fischer, 1884:38; cf. Table 1). Nonetheless, given the difficulty of separating females of *sexlineatus* from both sexes of *pinguis*, some of the syntypes of *varius* could be the same as the later-described taxon *pinguis*. In particular, Fischer's "specimen c" has 92 subcaudals, an unusually high count for *sexlineatus* females, but a typical one for *pinguis* males (Table 1) (assuming a complete tail and correct counts); other details given for this specimen conform to either *pinguis* or *sexlineatus*. Fischer (1884) also alludes to varying development of the lateral and ventrolateral stripes ("often beginning at the middle of the body"), and paired ventral spots, in his series of *varius*; these characteristics also suggest *pinguis* (see species account).

Liopholidophis sexlineatus is most similar to *L. pinguis* in overall habitus and color pattern. Males of *pinguis* have short tails (<35% total length; <110 subcaudals) compared to males of *sexlineatus* (>40% total length; >120 subcaudals), and the relative eye size of *pinguis* is smaller than that of *sexlineatus* (Table 1). Most specimens of *pinguis* have less distinct stripes on the anterior body than *sexlineatus,* and the venter in the former is usually light-colored (sometimes with edges of ventrals blackened or with a median series of small paired spots); in *sexlineatus,* the stripes are distinct the entire length of the body (flanks may be entirely darkened) and, although the venter may be immaculate, it is often heavily and irregularly splotched with black.

Distribution (Fig. 3). Scattered localities on the eastern escarpment and lowlands from the southeastern tip of Madagascar (Glaw and Vences, 1994:336 [map]), north to at least Toamasina (Toamasina Province); a few localities on the high plateau as documented in the Appendix ("Manjakatompo") and as shown by Glaw and Vences (1994:336 [map]). Although seemingly locally abundant where it occurs (personal observations), *Liopholidophis sexlineatus* is recorded from relatively few localities in the literature.

In the RNP region, *Liopholidophis sexlineatus* appears ubiquitous in rice paddies and marshy areas and is known from approximately 500 to 1,130 m elevation.

Description. The following description is based on examinaton of 18 females and 15 males, including types of *Dromicus sexlineatus* and *D. macrocercus.* Measurements, proportions, and scutellation are summarized in Table 1. Largest specimen a male (MCZ 11604), 1,338 mm total length, 663 mm tail length (50% of total); largest female (MCZ 11701) 726 mm total length, 238 mm tail length (33% of total). Tail length strongly sexually dimorphic, 41–51% of total length in males, 24–33% in females. Dorsal scales smooth, lacking apical pits, in 17–17–15 rows. Scale row reduction from 17 to 15 rows by fusion of rows 3 + 4 at the level of ventrals 90–115 (N = 17; 1 specimen showed fusion of 4 + 5 at the level of 92–95). Ventrals 147–163 in males, 139–148 in females. Anal plate divided. Subcaudals 127–160 in males,[9] 67–91 in females. Eight upper labials with 4–5 touching eye. Lower labials 9–9 (N = 12), 9–10 (8), 10–10 (11), or 11–12 (1), the first pair in contact behind the mental, 1–4 or 1–5 touching an anterior genial, 4–5 or 5–6 touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular usually single (occasionally 2). Temporals 1 + 2 (rarely 3 secondary temporals).

Body slightly higher than wide; ventrolateral edge of body rounded in females, slightly more angulate in males. Head wider than neck. Pupil round. Eye relatively small, its diameter approximately equal to or somewhat greater than distance between eye and posterior edge of nostril ($\bar{x}$ = 1.1 ± 0.16; range 0.95–1.44; N = 16). A few scattered pits on anterior head plates.

Dentition. Maxillary teeth 17–26 + 2 (N = 25; $\bar{x}$ = 23.9 ± 1.9 prefang teeth). Diastema essentially absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, twice as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. The skull from a prepared skeleton (MCZ 180332, female) has 15–15 palatine teeth, 34–35 pterygoid teeth, and 34–34 dentary teeth.

Hemipenis (Fig. 33). Deeply bilobed (nearly half the length of the organ), noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus that stops short of the tips of the lobes. Distal sulcate tips of the lobes with 8–10 papillae, each surmounted by a spine.

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[9] One male, MCZ 11605, has unusually low subcaudal (127) and maxillary tooth (17) counts (next highest values 140 and 20, respectively). This possibly represents normal variation within *sexlineatus* but needs clarification with a thorough study of geographic variation in this taxon. MCZ 11605 also has an unusual coloration (see "Remarks") but, unfortunately, lacks precise locality data.

Coloration in Life (RNP Region), Based on MCZ 180326-35 (see Glaw and Vences, 1994:pl. 348). Middorsal area five scales wide dark olive brown or medium brown, three rows either side of this olive brown; rows 1–3 grayish brown, but with variable amount of black (generally much black on 2–3, especially anteriorly, with black increasing on 1–3 posteriorly). Edges of scale row 3 and 7–9 often with striking white border (very thin); this more prominent on anterior body, and on dorsal edge of row 3. Extreme outer edge of ventrals black, forming black stripe in conjunction with black pigment on dorsal row 1. Remainder of venter with ground color of dull cream, but often heavily invested with black, especially toward posterior end of body. Top of head dark olive brown. Postorbital bar black. Upper and lower labials, and throat dull whitish.

The pattern of *Liopholidophis sexlineatus* in the RNP area is similar to the color plate in Glaw and Vences (1994:pl. 348), but the colors are more subdued: median dorsal area darker brown, and dorsolateral ground color dull olive brown rather than yellowish brown.

Coloration in Preservative. Although the specific epithet refers to six stripes, most specimens I examined have only four distinct stripes, and general darkening of the flanks may obscure the lateral and ventrolateral stripes entirely so that the snake appears to be a brown snake with black flanks. Günther (1882:265) indicated similar variation, stating that *sexlineatus* has "six black longitudinal bands, of which, . . . two or more may be indistinct or disappear altogether." The entire range of variation is seen within the sample from the RNP, and I detected no geographic trend.

When the complete complement of six stripes is present, they are disposed as follows: (1) a black border on the suture between the ventral plates and dorsal row 1; (2) a facial stripe beginning on the upper edge of the supralabial row, widening as a postocular stripe, continuing onto body, where it usually occupies the lower ⅔ of row 3 + upper ⅓ of row 2; occasionally involving lower portion of row 4; (3) a stripe, usually indistinct and often absent, on the suture between dorsal rows 6 and 7. In some specimens the entire lower 3 dorsal rows are blackened, or blackened with only a central spot of light pigment in each scale, with the black extending a variable distance onto the ventral plates (Fig. 21). The median 5 dorsal rows are darker brown than more lateral rows (1–6), which are grayish brown. The venter is whitish, but with a highly variable investment of black: most specimens from the RNP have at least the lateral edges of the ventrals black, but often black is the predominant ventral coloration. Additional comments are given in the "Remarks."

Natural History. Liopholidophis sexlineatus is diurnal and semiaquatic. The species is abundant in rice fields, especially those somewhat overgrown around the edges of paddies, and with a covering of *Azolla* or duckweed. It seems most characteristic of sluggish or standing water, but the species was abundant in tall (0.5 m) grass along one whitewater river with rocky substrate next to rice fields, and two snakes in the same area were in water at the edge of the river. I never observed *L. sexlineatus* in primary or secondary forests, including aquatic habitats therein (small forest streams and pools, larger rivers). *Liopholidophis sexlineatus* was observed in apparently natural habitats only near Sahavondrona, within the RNP. Here, the species was associated with meadows, bogs, and marshes, which, during the rainy season, fill with standing water to depths of up to 0.5 m. The meadows occupied depressions of varying sizes surrounded by higher ground supporting forest and are possibly maintained as meadows by seasonal flooding during part of the year. The meadows near Sahavondrona were filled with a grass/sedge association and were breeding and/or retreat sites for species of *Heterixalus* spp. (Hyperoliidae), *Ptychadena mascareniensis* (Ranidae), and *Boophis* spp. and *Aglyptodactylus madagascariensis* (Rhacophoridae). *Liopholidophis sexlineatus* is inoffensive and does not bite in defense.

Glaw and Vences (1994:338), citing personal communication from C. Domergue, reported *L. sexlineatus* as ovoviviparous (=viviparous *fide* terminology of Blackburn, 1994), but the basis for the inference was not stated. Given the long egg retention times of many oviparous squamates (Shine, 1983), and the rather stringent criteria that must be met to be assured of correct inference of reproductive mode (Blackburn, 1993), the report of viviparity in *sexlineatus* needs confirmation. I can offer only partial corroboration. Five females in the RNP sample collected 8 December were gravid, with 4–10 embryos (determined by palpation and inspection), as follows: MCZ 180325 (SVL 400 mm; 7 embryos), MCZ 180329 (SVL 452 mm; 10), MCZ 180330 (SVL 333 mm; 4); MCZ 180331 (SVL 408 mm; 7), and MCZ 180334 (SVL 475 mm; 8). In all cases, the developing embryos were surrounded by fetal membranes, but without thickened shell membranes or leathery shell. Two embryos removed from MCZ 180334 were in Zehr (1962) stage 25–26; one removed from MCZ 180329 was approximately stage 24. Because all gravid females were collected at the same time, and none showed any apparently more advanced embryos upon casual inspection, no other embryos were examined directly. Embryos of other species of *Liopholidophis* of comparable stages of development (see species accounts) are invariably surrounded by leathery shells; absence of such a shell in *L. sexlineatus* is taken to confirm the presence of viviparity in this species (but see cautionary notes in Blackburn, 1993).

All dietary items for *Liopholidophis sexlineatus* were frogs. I was drawn to a specimen in a marsh by the loud release calls of a *Ptychadena mascareniensis*, which the snake was eating at 1350 hr on 22 November 1990. The snake was in a relatively open boggy area under a small clump of vegetation; much of the marsh had tall (80–100 cm), dense grass. MCZ 180376 (SVL 439 mm) contained 14–16 *Heterixalus* cf. *madagascariensis*. MCZ 180338 (SVL 472 mm) contained unidentifiable remains of a small frog. Four specimens from Ambatolahy near the RNP col-

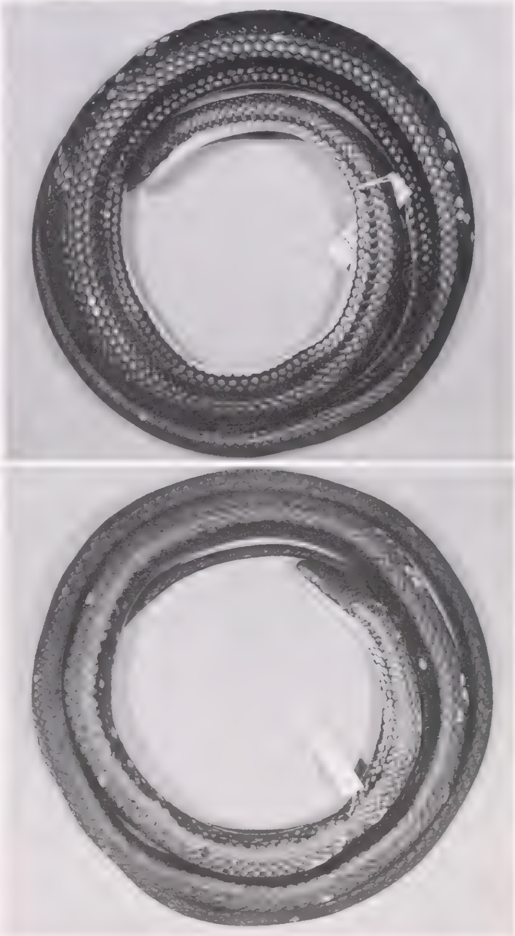

Figure 21. *Liopholidophis sexlineatus* (Günther). Top: Specimen from the RNP (MCZ 180331). Bottom: Specimen from near Midongy du Sud (MCZ 180379). Note the darkening along the suture lines of dorsal rows 1–2 in the former and the complete darkening of the flanks in the specimen from Midongy du Sud, rendering the lateral stripe indiscrete except on the anterior part of the body.

lected 8 December 1990 and held in a common collecting bag regurgitated frogs (*Ptychadena mascareniensis, Heterixalus betsileo,* and *H. alboguttatus*).

The frogs recorded in the diet of *Liopholidophis sexlineatus, Heterixalus* and *Ptychadena,* are the most commonly encountered frogs in the marshes and rice fields that are the major habitats of *sexlineatus.*

Remarks. Günther (1882) described females and males of *Liopholidophis sexlineatus* (as *Dromicus sexlineatus* and *D. macrocercus,* respectively) in the same paper, failing to realize that the extraordinary differences in tail length and subcaudal counts manifested sexual dimorphism (of a nature hitherto unknown in snakes). Curiously, he thought he had males and females within the series of syntypes he described as *sexlineatus* (p. 265, comment referring to dimorphism in ventral color). The error was caught by Boulenger (1893: 246), who correctly identified types of *sexlineatus* as females and those of *macrocercus* as males. Boulenger (1893) synonymized the two species and, as first revisor, fixed the name of the taxon as *sexlineatus* (International Commission on Zoological Nomenclature, 1985:article 24[a]).

The type locality, "eastern Betsileo" refers to territory on the eastern edge of the plateau and the adjacent escarpment between approximately parallels 21° and 22°30'S (the Betsileo being one of the indigenous peoples inhabiting this region; see, e.g., Gallieni, 1908:pl. 6). Thus, the syntypes of *sexlineatus* come from the general region of the RNP, but probably from the adjacent plateau rather than from the escarpment itself.

Aside from the variable distinction of the dorsal stripes (see Coloration), the amount and distribution of black pigment in *Liopholidophis sexlineatus* varies considerably. Unfortunately, samples have been insufficient to fully characterize the variation (possibly geographic). Future studies should comprehensively survey the taxon throughout its range to discern whether or not more than one taxon is involved. The following comments highlight patterns I discerned.

Specimens from Toamasina Province (MCZ 11602–06) have little black pigment on the venter or on dorsal rows 1–2, except for the upper portion of row 2 involved in the lateral stripe and some darkening or spotting along the suture lines between ventral plates. In MCZ 11605 the lateral and ventrolateral stripes are indistinct (restricted to suture lines), and the snake is nearly plain brown. Specimens from farther south (RNP sample and Midongy du Sud) have varying degrees of black, sometimes extensive, on the venter and rows 1–2. In some RNP specimens, rows 1–2 are blackened so that only a central light spot of each scale remains (Fig. 21), whereas lateral stripes are rather distinct in most specimens from the RNP. In adults from Midongy du Sud (and one specimen from the RNP region, MCZ 180338), rows 1–3 (i.e., including the lateral stripe) and the adjacent venter are entirely blackened (Fig. 21); one near-hatchling (MCZ 180378; SVL 180 mm) from Midongy du Sud shows no general darkening of rows 1–3, suggesting that the black flanks in adults develop ontogenetically.

The extent of ventral pigmentation is highly variable within a locality. For example, in MCZ 180376 (Midongy du Sud) only the outer 12–15% of each ventral plate is black, with the rest of the venter immaculate whitish, whereas in MCZ 180379 from the same locality most of the ventral plates are obscured by black. Two specimens from a relatively high elevation in the RNP region (MCZ 180336–37, 1130 m) have relatively immaculate venters, whereas specimens from lower elevations in the same area (e.g., MCZ 180325–35, 850 m) have heavily pigmented venters. Günther (1882:265) commented that the venter was darker in females than in males, but that trend does not hold in the series from the Ranomafana region when other sources of variation are considered.

The Malagasy names *mandodrano* and *anakanify* are used for *Liopholidophis sexlineatus* in the RNP area.

Liopholidophis pinguis Parker
Figures 12, 22

Liopholidophis pinguis Parker, 1925:390 (Type locality: "Antsihanaka"). Holotype, BMNH 1946.1.7.66 (formerly 1925.8.25.7), an adult male [not seen]. Werner, 1929:11; Guibé, 1958:216; Domergue, 1973:1397; Brygoo, 1983:55, 1987:24; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992:266, 1994:338.

Liopholidophis pinguis Parker (1925) is not known to occur in the RNP. I have no field experience with the species and know nothing of its natural history.

Holotype. BMNH 1946.1.7.66 (not seen), an adult male obtained by W. F. H. Rosenberg; 890 mm total length, 300 mm tail length, with 151 ventrals and 91 subcaudals *fide* Parker (1925).

Diagnosis. A species of *Liopholidophis* having 17–17–15 dorsal scale rows, but lacking sexual dimorphism in tail length as extreme as in other members of the *sexlineatus* group. The number of midbody scale rows distinguishes *pinguis* (17) from members of the *stumpffi* group (19). The short tail (<35% total length) and corresponding low numbers of subcaudals (<110) in males distinguish *pinguis* from males of other members of the *sexlineatus* group (tail >35% total length and >120 subcaudals in males). *Liopholidophis pinguis* is most easily confused with *L. sexlineatus* (see "Key to Species"), and characters reliably separating females of the two species are subtle. The relative distinctness of the lateral stripes seems to be the most reliable feature (see "Key to Species" and species account for *sexlineatus*). Other species of the *sexlineatus* group have higher numbers of subcaudals (Table 1) and are either striped with distinctive nape spots (*rhadinaea*) or have distinctively patterned venters (*dolicocercus* and *grandidieri*) (see species accounts).

Distribution. Known from the vicinity of the type locality, Antsihanaka, and the nearby Lake Alaotra, and from the Perinet (=Andasibe) reserve (Appendix; Glaw and Vences, 1994:336 [map], 472); all are in the eastern forest region (Fig. 3). The locality for one specimen (SMF 61909) is recorded as "Nord-Madagascar" (northern Madagascar), and the UICN/PNUE/WWF (1990) records "Moramanga" [18°56′S, 48°12′E] without documentation. See "Remarks."

Description. The following description is based on examinaton of 6 females and 5 males but incorporates data for the holotype (Parker, 1925). Measurements, proportions, and scutellation are summarized in Table 1. Largest specimen the male holotype (BMNH 1946.1.7.66), 890 mm total length, 300 mm tail length (34% of total; Parker, 1925); largest female (BMNH 1936.3.3.94–97, largest of two females in the series), 664+ mm total length, incomplete tail 86+ mm. Proportional tail length moderately sexually dimorphic, 30–34% of total length in males, 25–26% in females. Dorsal scales smooth, lacking apical pits, in 17–17–15 rows. Scale row reduction from 17 to 15 rows by loss of row 4 (N = 6 sides), fusion of 3 + 4 (N = 4 sides), or fusion of 4 + 5 (N = 4 sides) at the level of ventrals 87–102. Ventrals 147–154 in males, 139–147 in females. Anal plate divided. Subcaudals 88–99 in males, 67–71 in females. Eight upper labials with 4–5 touching eye (unilateral presence of 9 in one specimen). Lower labials 10–10 (N = 5) or 9–10 (N = 5), the first pair in contact behind the mental, 1–4 or 1–5 touching an anterior genial, 4–5 or 5–6 touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular usually single (unilaterally divided in two specimens). Postoculars 2. Temporals 1 + 2.

Body about as high as, or slightly higher than, wide; ventrolateral edge of body slighly angulate. Head slightly wider than neck. Pupil round. Eye very small, its diameter less than the distance between the eye and posterior edge of nostril ($\bar{x} = 0.88 \pm 0.06$; range 0.77–0.94; N = 5). Scattered pits on head plates.

Dentition. Maxillary teeth 20–24 + 2 (N = 9; $\bar{x} = 21.7 \pm 1.3$ prefang teeth). Diastema absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, twice as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. A skull (MCZ 11701, male) has 13–13 palatine teeth, 28–30 pterygoid teeth, and 29–28 dentary teeth.

Hemipenis. Deeply bilobed (somewhat less than half total length), noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus.

Coloration in Preservative (Based on USNM 149242 and SMF 61909; AMNH 60692 is similar; see Fig. 22). These are the most recently collected and best-preserved specimens I have seen. No distinct stripes on most of the body, but thin darkened edges to many dorsal scales gives a somewhat braided appearance. Dorsal ground color grayish brown. Thin dark postocular bar extending from extreme lower edge of lower postocular and upper edge of supralabial 5, across lower edge of anterior temporal/upper edge of labials 6–7, ending on anterior portion of labial 8. Except for thin upper blackened border, supralabials dirty white finely peppered with dark. Minute tubercles and pits on anterior head plates. Blackened suture line between ventrals and dorsal row 1, broadening on posterior body and tail to form a distinct stripe at subcaudal/dorsal caudal suture that continues to the tail tip. Similar blackened border between rows 2 and 3 on posterior ½ of body (ending at vent or on anterior part of tail), forming a distinct stripe on posterior 30% of body in SMF 61909. Scale row 3 of SMF 61909 highlighted with white dots on anterolateral portion of each scale (more evident anterior to lateral stripe and dots more consistently present on upper edge of scales); similar, but less distinct, dots present in USNM 149242.

Venter grayish white with most ventrals (especially posteriorly) having thin blackened anterior border. Subcaudals immaculate grayish white, except for the lateral blackened edge.

A series of *Liopholidophis pinguis* from "Lake Alaotra" (BMNH 1936.3.3.94–97) and another series probably from close to there (MCZ 11698–701; see Appendix for comment) are similar to those just described but have more distinct lateral stripes. The stripe along the suture between the ventrals and dorsal row 1, manifested by black pigment at the extreme lateral edges of the ventrals, is obvious primarily on the posterior body and on the tail. A lateral stripe is manifested by a series of dashes or small dots on row 3 anteriorly (pigment at anterior–posterior junction of adjacent scales), or on the suture between rows 2 and 3 posteriorly; anteriorly, it is invariably a "dotted" line; posteriorly, it varies from bare shading of the suture line in a zigzag pattern to a distinct lateral stripe involving more of the adjacent scales. The lateral stripe either stops at the vent or on the anterior part of the tail or merges with the ventrolateral stripe; tail with a black stripe at lateral edges of the subcaudals continuous with the ventrolateral body stripe. In the MCZ series, dorsal row 3 on the anterior ½–⅔ of the body is highlighted by a pair of white dashes on the anterolateral portions of each scale; row 7 is partially similarly highlighted in one specimen. The venter is either immaculate, has obscure irregular grayish markings, or has suture lines between adjacent ventrals outlined indistinctly in black. Two specimens have a series of irregular dashes laterally on each ventral (distinct only anteriorly in one of the two). The supralabials are largely immaculate; a dark postocular bar extends across the top of the last 3 supralabials from the ventroposterior edge of the eye. The gular region and infralabials are immaculate.

Parker (1925) reported the type as having a distinct black lateral stripe from the eye to the vent on scale row 3 (2 + 3 posteriorly), black spots on the outer ends of the ventrals and subcaudals, and a series of indistinct black dots on either side of the midventral line.

Remarks. The type locality, Antsihan-

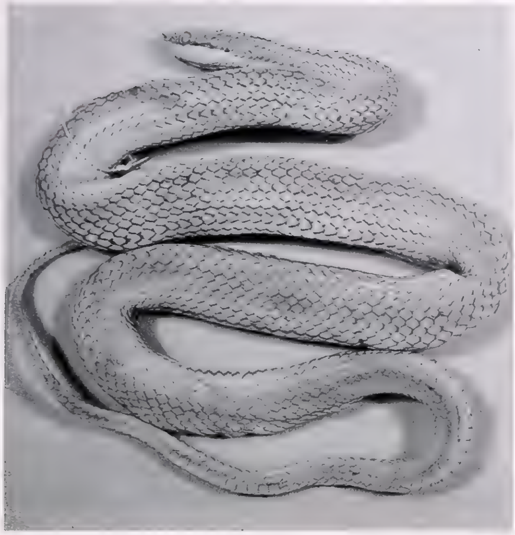

Figure 22. *Liopholidophis pinguis* Parker. Specimen (USNM 149242) from Perinet [=Andasibe]. See also Figure 12.

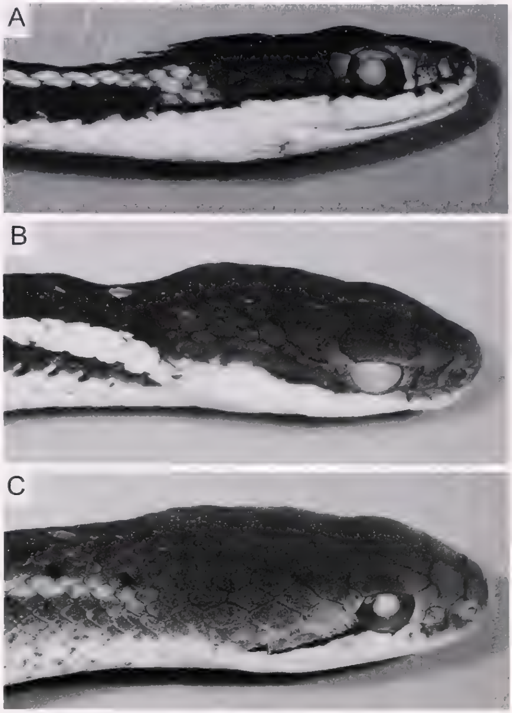

Figure 23. Heads of species of the *Liopholidophis stumpffi* group, in dorsolateral view. A. *L. epistibes,* new species (MCZ 180324). B. *L. lateralis* (Duméril, Bibron, and Duméril) (MCZ 180349). C. *L. infrasignatus* (Günther) (MCZ 180359). See Figures 8 and 25 for *L. stumpffi* (Boettger) and also Figure 28 for *L. infrasignatus* (Günther).

aka, is the name for a region in the vicinity of Lake Alaotra, a large freshwater lake at the edge of the central plateau. The Sihanaka are one of Madagascar's indigenous peoples inhabiting the area around the lake; "*Antsihanaka*" literally means "land of the Sihanakas." See, for example, the maps of indigenous peoples in Gallieni (1908:pl. 6) and Grandidier (1893). *Sihanaka* can also mean simply "lake," from which the name of the people and the region may derive. The locality was discussed by Carleton and Schmidt (1990:9) as "Sihanaka Forest." Parker (1925:390) stated that the Antsihanaka country was "situated between Lake Alaotra and the first belts of the eastern forest."

A series of *pinguis* in the MCZ from the "eastern Forest" was heretofore identified as *sexlineatus* (MCZ 11698–701 collected by Frederick R. Wulsin, June to September, 1915). According to Barbour (1918: 479), the portion of Wulsin's collection labeled as coming from the "Eastern Forest" was collected "at a point about half way between Tamatave and Tananarive" (=Toamasina and Antananarivo, respectively). Unfortunately, the data are no more precise. Wulsin collected at Andaingo (18°12′S, 48°17′E; Barbour, 1918:478), just south of Lake Alaotra, from where most specimens of *pinguis,* including the type, seem to have come. Wulsin's specimens of *pinguis* could be from this region, whose location is consistent with Barbour's more vague description of the locality.

The *stumpffi* Species Group (Parker, 1925)

Figures 23–29 (see also Figs. 7–11); Table 2

Content. *Dromicus stumpffi* Boettger, 1881a:358, 1881b:441.

Leptophis lateralis Duméril, Bibron, and Duméril, 1854:544.

Ptyas infrasignatus Günther, 1882:263. (Senior synonym of *Liopholidophis thieli* Domergue, 1973, of recent authors, as shown later).

Liopholidophis epistibes, described herein.

The *stumpffi* group includes two broadly distributed species, *infrasignatus* and *lateralis,* and I have not undertaken a study of their geographic variation. A more thorough investigation may show these to be composites.

Liopholidophis stumpffi (Boettger)

Figures 8, 24–25

Leptophis lateralis Duméril, Bibron, and Duméril, 1854 (part): (Type locality, Madagascar). Syntypes, MNHN 7312 (1 ♂, 3 ♀) *fide* Guibé (1958:214) [not seen]. Günther, 1890:70. Boulenger, 1893:247. Mocquard, 1904:302.[10]

Thamnosophis lateralis Jan and Sordelli, 1879: Boulenger, 1893:247.

Dromicus stumpffi Boettger, 1881a:358, 1881b:441, pl. 1, fig. 2 (Type locality, Nossi-Bé). Syntypes: three specimens collected by Antonio Stumpff and originally in the Senckenberg Museum; presumably three of four adults listed under catalog number 7247a by Boettger (1898:25). SMF 17576 is here designated the lectotype; see remarks.

Ptyas infrasignatus Günther, 1882: Günther, 1890: 70 (synonym of *Dromicus stumpffi* Boettger). Boulenger, 1893:247 (synonym of *Tropidonotus stumpffi*). *Ptyas infrasignatus* is here recognized as a valid senior synonym of *Liopholidophis thieli* Domergue, 1973 (see later).

Dromicus baroni Boulenger, 1888:104: (Type locality, Madagascar). Holotype, BMNH 1946.1.7.67 (old number 87.12.22.38) [examined]. Günther, 1890:70 (synonym of *Dromicus stumpffi* Boettger). Boulenger, 1893:247 (synonym of *Tropidonotus stumpffi*). Here recognized as a synonym of the resurrected *Ptyas infrasignatus* Günther.

Tropidonotus stumpffi (Boettger): Boulenger, 1893: 247. Boettger, 1898:25, 1913:312; Mocquard, 1895a: 102, 1895b (*Tropidonotus stumpfei*); Jourdran, 1903:32 (*T. stumpfii*). Boulenger, 1915:373–374. Kaudern, 1922:445 (cited specimen probably = *L. epistibes*; see species account).

Liophidium gracile Mocquard, 1908:261: (Type locality, Montagne d'Ambre and Nossi-Bé). Syntypes, MNHN 1893.211, an adult male collected May–July, 1893 by Alluaud and Belly at Montagne d'Ambre (Mocquard, 1895:123) [examined]; and MNHN 84-595, a juvenile, probably female, collected at Nossi-Bé [examined]. Boulenger, 1915:374 (questionably listed as synonym of *Tropidonotus stumpffii*). Both of the syntypes of *Liophidium gracile* are here recognized as the same taxon as *Dromicus stumpffi* Boettger.

Liopholidophis lateralis (Duméril, Bibron, and Duméril) (part): Mocquard, 1909:89; Werner, 1929: 11; Guibé, 1954:243, 1958:213. (*Dromicus stumpffi* Boettger listed as synonym).

Liopholidophis stumpffi (Boettger): Parker, 1925:391. Domergue, 1973:1401; Nicoll and Langrand, 1989: 44, 72, 130; Brygoo, 1983:55, 1987:24; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992: 226, 1994:338. As noted in the description of *L. epistibes* herein, most of Domergue's (1973) specimens of "*stumpffi*" from eastern Madagascar (followed by subsequent authors) probably are *epistibes*.

Liopholidophis infrasignatus (Günther): Parker, 1925: 391 (synonym of [*Dromicus*] *stumpffi* Boettger).

Notes on Types and Designation of Lectotype. Boettger (1881a,b) described *Liopholidophis stumpffi* from three specimens collected by Antonio Stumpff, consul to Madagascar, on the island of Nosy-Be (the former paper is a brief description in Latin; the latter paper repeats verbatim the Latin description, followed by a detailed description in German). Boettger (1881b) gave detailed measurements and scale counts for the three syntypes. I examined eight specimens collected by Stumpff at the type locality (BMNH 1946.1.23.51, FMNH 18291, SMF 17576 [listed as "*typus*" in SMF records], SMF 17580-84). With the exception of SMF 17576, my scale counts and measurements do not correspond well with the details given by Boettger (1881b), and SMF 17576 (Figs. 24–25) is hereby designated the lectotype of *Dromicus stumpffi* Boettger.

SMF 17576 apparently is specimen "No. 1" in Boettger (1881b). Details on this specimen are as follows (Boettger's data in parentheses): A gravid adult female, total length 711 mm (750), tail length 236 mm (237), tail as a proportion of total length 33%; 2 preventrals + 151 ventrals (153),

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[10] *Liopholidophis lateralis* has, since Boulenger (1893), been assigned to the synonymy, in part, of *stumpffi* Boettger. But the general confusion of *stumpffi*, *epistibes*, and *infrasignatus* in the literature suggests a reevaluation. Guibé (1954:242) gave 166 as the ventral count for the male syntype of *lateralis* and stated that it has "a median black spot on each ventral" (Guibé, 1958:214). Both statements conform more to *epistibes* than to other members of the *stumpffi* group (see Table 2 and other species accounts). Nonetheless, the syntypes of *lateralis* must be reexamined to correctly place the synonymy.

Table 2. Variation in mensural and meristic characteristics of species of the *Liopholidophis stumpffi* group. Scale counts and body proportions are $\bar{x}$ ± SD (sample size) with ranges below in parentheses; maxillary tooth counts are prefang count ranges (+2 fangs), followed by $\bar{x}$ ± SD (sample size). Tabulations for *infrasignatus* include data on ventral and subcaudal counts and relative tail proportions of *L. thieli* from table II of Domergue (1973:1405).

	stumpffi	*epistibes*[1]	*lateralis*	*infrasignatus*
Dorsals	19–19–17	19–19–17	19–19–17	19–19–17
Ventrals				
Males	150.7 ± 1.37 (6)	162.3 ± 3.55 (7)	154.0 ± 4.83 (28)	149.0 ± 3.18 (17)
	(149–153)	(157–166)	144–165[2]	(141–156)
Females	149.4 ± 4.02 (7)	160.6 ± 4.63 (17)	159.5 ± 4.86 (20)	152.7 ± 3.86 (35)
	(145–157)	(151–167)	151–166	(144–161)
Subcaudals				
Males	97.0 ± 6.00 (6)	96.7 ± 4.35 (7)	89.5 ± 6.26 (22)	73.4 ± 4.27 (15)
	(89–104)	(91–104)	(80–98)	(66–81)
Females	98.3 ± 5.47 (7)	88.8 ± 3.53 (16)	87.9 ± 6.31 (15)	67.7 ± 2.64 (30)
	(91–109)	(83–96)	(76–97)	(62–73)
Maximum length (mm)				
Total (SVL)				
Males	627 (416)	709 (471)	729 (517)	727+ (606)
Females	711 (475)	829+ (634)	820 (586)	920 (712)
Tail length/total				
Males	0.32 ± 0.02 (6)	0.31 ± 0.02 (7)	0.29 ± 0.01 (22)	0.25 ± 0.01 (16)
	0.29–0.34	0.28–0.34	0.27–0.31	0.23–0.27
Females	0.33 ± 0.01 (7)	0.29 ± 0.01 (15)	0.27 ± 0.01 (15)	0.23 ± 0.01 (29)
	0.31–0.34	0.27–0.31	0.25–0.29	0.21–0.24
Maxillary teeth	25 + 2—31 + 2	22 + 2—29 + 2	25 + 2—30 + 2	20 + 2—25 + 2
	27.8 + 2 (6)	26.4 + 2 (16)	26.6 + 2 (18)	22.3 + 2 (28)
Eye diameter/eye-nostril distance	1.22 ± 0.07	1.38 ± 0.17	1.1 ± 0.09	1.21 ± 0.10
	1.13–1.31 (7)	1.16–1.69 (12)	0.97–1.3 (24)	1.06–1.44 (19)

[1] As noted in the text, most specimens referred to *L. stumpffi* by Domergue (1973:table I) probably are *epistibes*. Extreme values for meristic and mensural statistics represented by Domergue's specimens, where different from those reported here, are ventrals: ♂, 151; subcaudals: ♂, 105; ♀, 80; total length: ♂, 798 (548); ♀, 945 (675); tail length/total: ♀, 0.32. In these I have excluded Domergue's specimen from Marojezy, which may represent true *stumpffi* (see text, "Distribution" in the *epistibes* species account).

[2] Domergue (1972:table III) reported the following ranges for meristic counts for *lateralis*: ventrals 154–170 (♂), 152–174 (♀); subcaudals 86–99 (♂), 58–98 (♀). I suspect low values for the female subcaudal counts reflect incomplete tails. As Domergue did not give values for individual specimens, these data were not included in calculations provided here.

divided anal plate, subcaudals 96 (98), 1 preocular, 2 postoculars, 2 + 2 temporals; 8–8 supralabials, 4–5 in contact with eye; 10–10 infralabials. Dorsals in 19–19–17 rows, the posterior reduction occurring by fusion of rows 3 + 4 at the level of ventrals 92–90. Horizontal eye diameter 4.0 mm. Anterior edge of eye to posterior edge of nostril 3.1 mm.

Diagnosis. Liopholidophis stumpffi differs from members of the *sexlineatus* group in having 19–19–17 dorsal scale rows (vs. 17–17–15). It differs from other species of the *stumpffi* group primarily in color pattern and a few body proportions, including the following: relatively long tail and high number of subcaudals (31–34% of total length and 91–109, respectively, sexes combined); dorsolateral light stripe on rows 4–5 on neck and anterior part of body, row 4 or 4–5 when present posteriorly; dark postocular stripe separated from dark blotches on side of neck; dorsolateral light stripe continuous with light color of throat; venter mostly immaculate except for pigment encroaching laterally from flanks (small spots may be present on extreme anterolateral edge of anterior ventral plates, but these are not inset from edge of the plates).

Liopholidophis stumpffi is most easily confused with *epistibes,* and their distinguishing characteristics are given in the account for the latter.

Liopholidophis stumpffi differs from *L. lateralis* in the position of the lateral stripes: in *stumpffi* on dorsal rows 4–5 on neck and anterior body, usually fading posteriorly (indistinct on tail); in *lateralis* on rows 3–5 (occasionally only row 4), very distinct the length of the body, continuing to the tail tip. The species also differ in color pattern: indiscrete dark spots on neck and anterior body, and brownish posterior body with light stripes indistinct or absent in *stumpffi*; continuous dark middorsal stripe and flanks, separated by vivid light stripes the length of the body in *lateralis.*

Liopholidophis stumpffi differs from *infrasignatus* in the orientation of the postocular dark bar. In *stumpffi* the bar extends horizontally posterior to the eye, paralleling the upper border of the posterior supralabials (Figs. 8, 25); in *infrasignatus* the bar extends at an angle downward across the penultimate and ultimate supralabials (Figs. 23, 28). In *stumpffi* the dorsolateral light stripe anterior is on scale rows 4–5 (5–6 in *infrasignatus*). *Liopholidophis stumpffi* also has a longer tail than *infrasignatus* (31–34% of total length vs. 21–27%, sexes combined; see Table 2), is of more gracile habitus, and has more distinct spots on the neck (present or not in *infrasignatus,* but not conspicuous).

Distribution. Liopholidophis stumpffi is here considered a species of extreme northern Madagascar. Most specimens examined are from the island of Nosy-bé, the type locality; three specimens (including one syntype of *Liophidium gracile* Mocquard) are from near the northern tip of mainland Madagascar in the vicinity of Montagne d'Ambre (Fig. 6 and Appendix). As pointed out in the account for *Liopholidophis epistibes,* most literature records of "*stumpffi*" from eastern Madagascar probably represent *epistibes,* and the distributional relationships between the two species in northern Madagascar are unclear.

Description. The following description is based on examination of seven females and six males, including the lectotype and other topotypical material (see preceding comments) of *Dromicus stumpffi* Boettger and the two syntypes of *Liophidium gracile* (Mocquard). Measurements, proportions, and scutellation are summarized in Table 2. Largest specimen a female, 711 mm total length, tail 236 mm; largest male 627 mm total length, 211 mm tail length. Tail length not sexually dimorphic, 32–34% of total length in males, 31–33% in females. Dorsal scales smooth, in 19–19–17 rows; 0–2 apical pits on different scales within an individual. Five of seven specimens showed posterior scale reduction by fusion of rows 3 + 4 at the level of ventrals 84–95; two of six specimens from the type locality for which this character was determined had fusion of rows 4 + 5 at ventrals 92–93.[11] Ventrals 149–153 in males, 145–157 in females. Anal plate divided. Subcaudals 96–104 in males, 91–109 in females. Eight upper labials (rarely seven or nine) with 4–5 touching eye. Lower labials usually 10–10 (eight specimens), with 9–10 (1) and 10–11 (1) being uncommon variants; first pair in contact behind the mental, 1–5 touching an anterior genial, 5–6 touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular single. Temporals 2 + 2.

Body slightly higher than wide; ventrolateral edge of body slightly angulate. Head

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[11] The type locality is an island, and the high frequency of an "unusual" scale reduction pattern (fusion of 3 + 4 seems to be the common mode of reduction in *Liopholidophis*) could reflect the isolated nature of the population. No other scale anomalies were detected in these specimens.

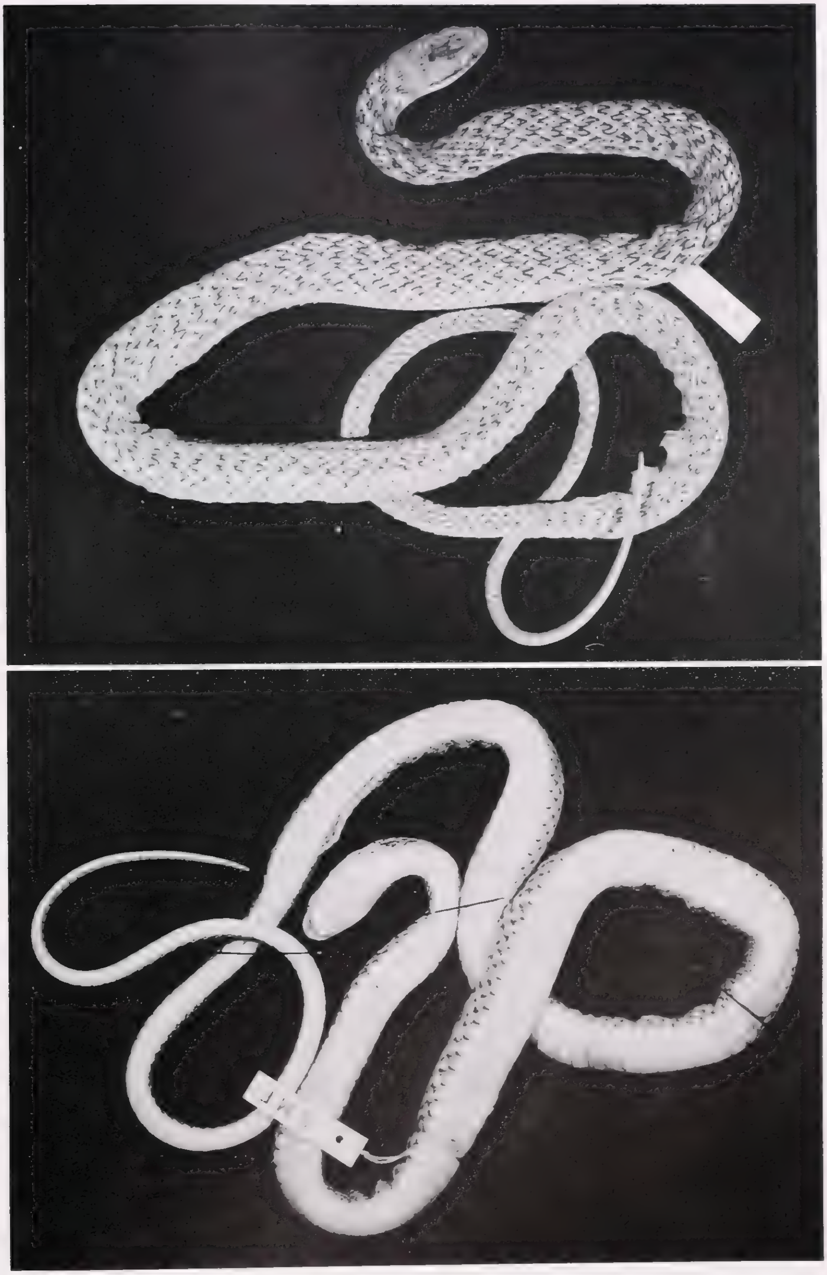

Figure 24. *Liopholidophis stumpffi* (Boettger), lectotype (SMF 17576, female) from "Nossi-Bé." Dorsal and ventral views.

slightly wider than neck. Pupil round. Eye large (Figs. 8, 23, 25), its diameter greater than the distance between eye and posterior edge of nostril ($\bar{x}$ = 1.22 ± 0.07; range 1.15–1.31; N = 7). Scattered minute pits on head plates, especially the supraoculars, prefrontals, and nasals.

Dentition. Maxillary teeth 25–31 + 2

(N = 6; $\bar{x}$ = 27.8 ± 2.23 prefang teeth). Diastema absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, 2 times as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed.

Hemipenis. Very deeply bilobed (dividing at the base of the organ and having an extremely short stalk), acalyculate (entirely spinose), and with a deeply divided centrolineal sulcus spermaticus. Tips of the lobes with a central "umbelliform" depression.

Coloration in Life. Unknown.

Coloration in Preservative. Most specimens I studied had lost most of the stratum corneum, and appear grayish with a black network the length of the body (formed by black borders to many scale rows), black irregular spots on the neck, and dorsolateral light stripes that vary in extent and discreteness. Two adult topotypes (FMNH 18291, SMF 17581) retain the stratum corneum. These are more or less brown snakes with an indistinct dark network on the dorsal scales, indistinct dark spots on the neck (generally 2–4 dorsal scales in size), and indistinct dorsolateral light stripes; top of the head brown to grayish brown; supralabials, infralabials, and gular region dirty whitish; blackish postocular bar; venter yellowish white, with dark encroaching pigment from flanks on lateral edges of ventral scales (plus dark punctations at lateral edges of anterior ventrals, as described in the diagnosis). The dorsolateral light stripes are anteriorly confluent with light color of the throat (Figs. 8, 25); they occupy rows 4–5 anteriorly, usually fading by midbody but on rows 4 or 4–5 when present posteriorly. In several individuals, including juveniles and adults (e.g., MCZ 54368, MNHN 1893-211), the light stripes continue to the tail tip and are bordered ventrally at the subcaudal/dorsal caudal suture by a blackish streak.

Three small juveniles (SMF 17582–84; total lengths 195–308 mm) are similar to adults in pattern, and the dorsolateral stripes also vary in discreteness and length, as in adults.

Natural History. *Liopholidophis stumpffi* presumably is diurnal and terrestrial like other members of the *stumpffi* group.

The lectotype (SMF 17576; SVL 475 mm; month of collection unknown) is a gravid female with four large eggs, as determined by palpation.

Remarks. The FMNH and the BMNH have specimens of *Liopholidophis stumpffi* collected by Stumpff on Nosy-Be and exchanged with the Senckenberg Museum in the 1880s (FMNH 18291 and BMNH 1946.1.23.51, respectively). The FMNH records indicate their specimen as a "paratype" (see, e.g., Marx, 1958:480), an impossible designation because Boettger's series consisted of three syntypes. Boulenger (1893:247) noted the BMNH specimen "As typical of *D. stumpffi*"; such a designation would be unlikely if the BMNH specimen were really a syntype, because in such cases Boulenger routinely used the word "type." In any case, my measurements and scale counts for these specimens do not correspond to any of the three syntypes of *stumpffi*, as reported by Boettger (1881a). Boettger (1898:25) listed eight specimens (catalog number 7247a) from Nosy-Be collected by Stumpff in the Senckenberg Museum at that time. In addition to the FMNH and BMNH specimens, the SMF now has several specimens collected by Stumpff on Nosy Be (Appendix).

Boettger (1881a,b) stated that *Liopholidophis stumpffi* has "two distinct apical pits." My observations revealed that the number of apical pits varies from 0 to 2 within an individual, even considering only those scale rows that occasionally had pits.

Liopholidophis lateralis (Duméril, Bibron, and Duméril)

Figures 23, 26

Leptophis lateralis Duméril, Bibron, and Duméril, 1854:544, part (Type locality, "Madagascar").

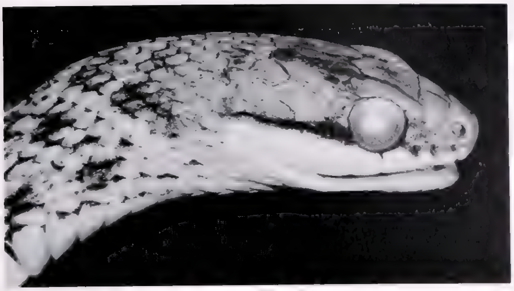

Figure 25. *Liopholidophis stumpffi* (Boettger), lectotype (SMF 17576, female). Dorsolateral view of head.

Dromicus melanotus, var. ? Günther, 1858:133: Boulenger, 1893:248 (synonym of *Tropidonotus lateralis*).

Thamnosophis lateralis (Duméril, Bibron, and Duméril): Jan, 1863:133. Jan and Sordelli, 1879:liv. 49, pl. II. Boulenger, 1893:248 (synonym of *Tropidonotus lateralis*). Guibé, 1954:243, 1958:213 (synonym of *Liopholidophis lateralis*).

Dromicus madagascariensis Günther, 1872:22, pl. V, fig. A.: (Type locality, "Madagascar"). Syntypes, BMNH 1946.1.15.19 (female), collector unknown, and BMNH 71.6.28.17 (male), obtained by Mr. Barlett [both examined]. The latter specimen is here recognized as the male syntype upon which Günther based his description. Boulenger, 1893:248 (synonym of *Tropidonotus lateralis*). Guibé, 1954:243, 1958:213 (synonym of *Liopholidophis lateralis*).

Ahaetulla lateralis (Duméril, Bibron, and Duméril): Boettger, 1877:33. Boulenger, 1893:248 (synonym of *Tropidonotus lateralis*). Guibé, 1954:243, 1958: 213 (synonym of *Liopholidophis lateralis*).

Philothamnus lateralis (Duméril, Bibron, and Duméril): Boettger, 1881b:526. Boulenger, 1893:248 (synonym of *Tropidonotus lateralis*). Guibé 1954: 243, 1958:213 (synonym of *Liopholidophis lateralis*).

Dromicus stumpffi Boettger, 1881a:358, 1881b:441, pl. 1, fig. 2: Mocquard, 1904:302, 1909:89; Guibé, 1954:243, 1958:213. (synonym of *Liopholidophis lateralis*). Here considered a valid taxon.

Ptyas infrasignatus Günther, 1882: Guibé, 1954:243, 1958:213 (synonym of *Liopholidophis lateralis*). Here recognized as a valid taxon.

Dromicus baroni Boulenger, 1888:104: Guibé, 1954: 243, 1958:213 (synonym of *Liopholidophis lateralis*). Here considered a synonym of the resurrected *Liopholidophis infrasignatus* (Günther).

Tropidonotus lateralis (Duméril, Bibron, and Duméril): Boulenger, 1893:248, 1915:374. Boettger, 1898:25, 1913:312. Jourdran, 1903:32. Kaudern, 1922:444.

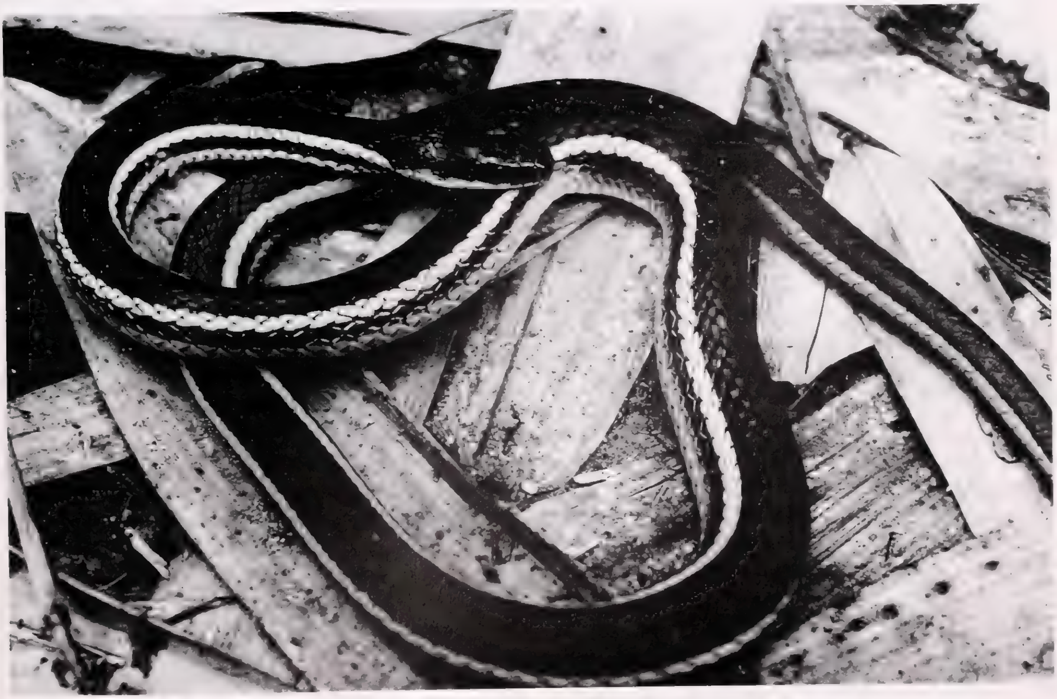

Figure 26. *Liopholidophis lateralis* (Duméril, Bibron, and Duméril). Specimen from the RNP, MCZ 180353.

Liopholidophis lateralis (Duméril, Bibron, and Duméril): Mocquard, 1904:303, 1909:43; Parker, 1925: 391; Werner, 1929:11; Guibé, 1954:243, 1958:213; Domergue, 1973:1398; Brygoo, 1983:55, 1987:24; Nicoll and Langrand, 1989:48, 88; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992:266, 1994: 337.

Liophidium gracile Mocquard, 1908:261: (Type locality, Montagne d'Ambre and Nossi-Bé). Syntypes, MNHN 1893.211 and MNHN 84-595 (see synonymy of *Liopholidophis stumpffi* Boettger for data). Guibé, 1958:213 (synonym of *Liopholidophis lateralis*). Here considered a synonym of *Dromicus stumpffi* Boettger.

Syntypes. MNHN 7312 (1 ♂, 3 ♀) *fide* Guibé (1958:214) [not seen]. Guibé (1954, 1958) gave some meristic counts and other descriptive data on the types.

Diagnosis. Liopholidophis lateralis differs from members of the *sexlineatus* group in having 19–19–17 dorsal scale rows (vs. 17–17–15). It is the only species of *Liopholidophis* with vivid dorsolateral light stripes (white to yellowish in life) centered on row 4 the entire length of the body and tail (adjacent parts of rows 3 and 5 usually also involved) (Fig. 26; Glaw and Vences, 1994:pl. 346). The dorsolateral light stripes are on rows 5–6 or 5–7 anteriorly in *epistibes* and *infrasignatus* and are indistinct posteriorly in *stumpffi* (see species account for other differences).

Superficially, *Liopholidophis lateralis* is similar to *Dromicodryas bernieri.* These two species can be distinguished in life by the brown (vs. black) dorsal ground color of *D. bernieri* as compared to *lateralis* (compare Glaw and Vences, 1994:pls. 342, 346) and by the anterior disposition of the dorsolateral light stripe: confluent or nearly so with the light gular coloration in *L. lateralis,* separated by dark flank coloration in *D. bernieri* (cf. Glaw and Vences, 1994:figs. 505–507). *Dromicodryas* has enlarged anterior mandibular teeth and differs in fundamental hemipenial characteristics from *Liopholidophis* (Guibé, 1958; personal observations).

Distribution. Liopholidophis lateralis, as presently understood, has an extraordinary geographic and macroenvironmental range, including the eastern lowlands and montane rainforest belt, scattered localities on the central plateau, and dry forests of western Madagascar (Fig. 6; for more comprehensive distribution maps, see Glaw and Vences, 1994:336; Domergue, 1973:1398). Domergue (1973:1401) recorded localities from sea level to more than 2,000 m elevation. Such an ecological amplitude for a snake species is rare and warrants a thorough assessment of geographic variation. In the vicinity of the RNP, *Liopholidophis lateralis* is known from approximately 500 to 900 m elevation.

Description. The following description is based on examinaton of 20 females and 28 males. Measurements, proportions, and scutellation are summarized in Table 2. Largest specimen a female (MCZ 11663), 820 mm total length, 234 mm tail length (29% of total); largest male (MCZ 180345) 729 mm total length, 212 mm tail length (29% of total; tip of tail missing). Tail length not strongly sexually dimorphic, 27–31% of total length in males, 25–29% in females. Dorsal scales smooth, in 19–19–17 rows (one individual each with 21–19–17 and 17–19–17); usually two apical pits on scales of all rows between the dorsolateral stripes (see "Remarks"). Scale row reduction from 19 to 17 rows by fusion of rows 3 + 4 (occasionally appears as loss of row 4) at the level of ventrals 85–105 (N = 11; two specimens with unilateral fusion of 4 + 5). Ventrals 144–165 in males, 151–166 in females. Anal plate divided. Subcaudals 80–97 in males, 76–97 in females. Eight upper labials with 4–5 touching eye. Lower labials usually 10–10 (N = 19), other variants being 8–9 (2), 9–9 (5), 9–10 (12), and 10–11 (4), the first pair in contact behind the mental, 1–5 (rarely 1–6) touching an anterior genial, 5–6 (rarely 6–7) touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular single. Temporals usually 2 + 2 (occasionally 1 anterior temporal or, less frequently, 1 posterior temporal; rather high frequency of azygous temporal scales, fragmentation of scales in temporal region, or fusion of a temporal with a supralabial).

Body slightly higher than wide; ventrolateral edge of body slightly angulate. Head distinctly wider than neck. Pupil round. Eye moderately large, its diameter equal to or slightly greater than the distance between the eye and posterior edge of nostril ($\bar{x} = 1.1 \pm 0.09$; range 0.97–1.30; N = 24). Scattered pits and tubercles on circumorbital and anterior head plates.

Dentition. Maxillary teeth 25–30 + 2 (N = 17; $\bar{x} = 26.6 \pm 1.6$ prefang teeth). Diastema absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, twice as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. Two skulls, MCZ 180350 and AMNH 60676 (both females) have the following tooth counts, respectively: 16–?, ?–21 palatine teeth; ?–35, 31^+–34 pterygoid teeth; 30–31, ?–34 dentary teeth.

Domergue (1973) reported 13–15 maxillary teeth and 15–23 dentary teeth in *Liopholidophis lateralis,* about half the tooth number I counted (25–30 prefang maxillary teeth and 30+ dentary teeth); I assume that Domergue failed to count empty sockets.

Hemipenis (Fig. 35). Deeply bilobed, noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Sulcus spermaticus centrolineal, dividing near the base of the organ. Tips of the lobes with a central "umbelliform" depression.

Coloration in Life and Preservative. In life, *Liopholidophis lateralis* appears as a black snake with whitish to yellowish lateral stripes (see Glaw and Vences, 1994: pl. 306). The lateral light stripes usually occupy row 4 and adjacent halves of rows 3 and 5 (occasionally rows 4–5, and in MCZ 180345 essentially restricted to row 4 anteriorly, 3–4 posteriorly); the stripes are continuous from the nape to the tip of the tail (uninterrupted at vent). Anteriorly, the stripes are usually confluent with the light (yellowish to whitish) color of the throat (occasionally separated by a narrow line of dark pigment; see Glaw and Vences, 1994:fig. 505). Dorsal rows below the lateral stripe are blackish, except for row 1, which tends to have only a stippling of blackish pigment (appears dirty white to grayish). The venter and underside of the tail are immaculate whitish to pale yellow, usually with outer edges of ventrals stippled with dark pigment and/or with small rounded black dots.

In preservative, the light stripes are whitish and the dorsal ground color grayish black to brownish. Upon loss of the stratum corneum, the scales become grayish or grayish brown.

Natural History. Liopholidophis lateralis is diurnal and terrestrial. It occurs in relatively open, often disturbed, areas (secondary growth and rice fields). I have never observed it in closed-canopy forest, either primary or moderately dense secondary forest. Domergue (1973:1401) and Glaw and Vences (1994:337) reported *L. lateralis* as being semiaquatic, but other than occasional (and, in Madagascar, inevitable) association with flooded rice fields, this species in my experience does not appear to be especially associated with water, certainly not to the extent of *L. sexlineatus. Liopholidophis lateralis* is abundant in appropriate open microhabitats in the vicinity of the RNP and seems especially active on very hot days.

These snakes often raise the head and anterior ⅓ of the body off the ground as an intruder approaches. They bite rather ineffectively (small teeth) when captured and often flatten the neck and body for about ⅔ of its length, exposing white skin between scales and broadening the body stripes. Domergue (1973:1401) also reported body inflation and neck flattening in *Liopholidophis lateralis,* exposing white markings on the scales. One individual I observed extended the tongue while slowly flicking it up and down, or held the tongue extended with little movement except at the tips for extended periods.

Domergue (1973) reported frogs in the diet of *Liopholidophis lateralis,* and that is confirmed by all my observations. Three *lateralis* in the RNP sample contained food: MCZ 180344 (SVL 547 mm) contained one *Mantidactylus betsileanus* (Ranidae; a terrestrial, diurnal frog) swallowed tail first; MCZ 180345 (SVL 517 mm) contained one *Boophis madagascariensis* (Rhacophoridae; at least sometimes terrestrial when inactive diurnally) swallowed head first; MCZ 180350 (SVL 543 mm) contained remains of one *Ptychadena mascareniensis* (Ranidae; terrestrial/semiaquatic, diurnal) swallowed head first. AMNH 60675 (SVL 537 mm) contained one *Ptychadena mascareniensis* swallowed head first and one other small unidentified frog swallowed tail first. In contrast to other species of terrestrial *Liopholidophis* with recorded food items, *lateralis* seems to consume terrestrial microhylids infrequently (the semiaquatic *L. sexlineatus* is another exception). This probably reflects the more open habitats frequented by *lateralis* and the absence of microhylids in those habitats. The frogs recorded in the diet are frequently encountered in open or secondary habitats, as is *L. lateralis.*

Domergue (1973) reported clutch sizes of 6–13 in *Liopholidophis lateralis* and observed several clutches at the end of November/beginning of December (locality not given). Hence, the species is oviparous. Two specimens from the RNP, MCZ 180348 (SVL 583 mm) and 180344 (SVL 547 mm) collected 6–11 January, contained nine and seven enlarged ovarian eggs, respectively. MCZ 180375 (SVL 491 mm), collected 13 January near Midongy Atsimo (Appendix), contained seven enlarged ovarian eggs.

Remarks. Most specimens of *lateralis* have two apical pits on all scale rows between the dorsolateral light stripes. Occasional specimens appeared to have no apical pits (e.g., MCZ 180380), and in still others the number of pits and their consistency varied. When present, the pits continue onto the dorsal caudal scales to the tail tip.

Liopholidophis infrasignatus (Günther)

Figures 23, 27–29

Ptyas infrasignatus Günther, 1882: 263 (Type locality, "Arkafana, Eastern Betsileo" [corrected to "Ankafana, Betsileo" by Boulenger, 1893:247; see "Remarks" and Cowan, 1883:147]). Lectotype by present designation, BMNH 1946.1.7.57, collected by Reverend W. D. Cowan.

Dromicus baroni Boulenger, 1888:104 (Type locality, "Madagascar"). Holotype, BMNH 1946.1.7.67 (old number 87.12.22.38), collected by R. Baron. [examined] **New synonymy.**

Tropidonotus stumpffii (Boettger), part: Günther, 1890:70; Boulenger, 1893:247–248 (*Ptyas infrasignatus* Günther listed as a synonym; specimens b–d [=BMNH 1946.1.7.56–58, types of *infrasignatus*] and k–m [=BMNH 95-10.29.53–55]).

Liopholidophis lateralis (Duméril, Bibron, and Duméril), part: Mocquard, 1909:95 (*Ptyas infrasignatus* Günther listed as synonym). Guibé, 1958:243 (*Ptyas infrasignata* [sic] Günther listed as a synonym).

Liopholidophis stumpffi (Boettger), part: Parker, 1925: 391 (*L. infrasignatus* (Günther) listed as a synonym in footnote).

Liopholidophis thieli Domergue, 1973:1405 (Type locality, "fish ponds of the Perinet Tropical Forestry Station, 900 m elevation). Holotype, MNHN 1973-332. **New synonymy.** Brygoo, 1983:55, 1987: 24; Nicoll and Langrand, 1989:117, 130; UICN/PNUE/WWF, 1990:223; Glaw and Vences, 1992: 266, 1994:338.

Notes on Types and Designation of Lectotype. *Ptyas infrasignatus* Günther is here considered the valid name for the species referred in recent literature to *Liopholidophis thieli* Domergue (references cited in synonymy). The type locality of *infrasignatus* is about 25 km ENE of the RNP, whereas the type of *thieli* is from Perinet (=Andasibe). Based on comparison of the types of *infrasignatus* and *thieli,* I conclude that they and the series from the RNP assigned to *infrasignatus* represent the same taxon. Additional comments on the type of *thieli* are given later (see "Notes on Type Specimens of Junior Synonyms").

The syntypes of *Ptyas infrasignatus* are BMNH 1946.1.7.56–58, two adult females and adult male, respectively [old numbers

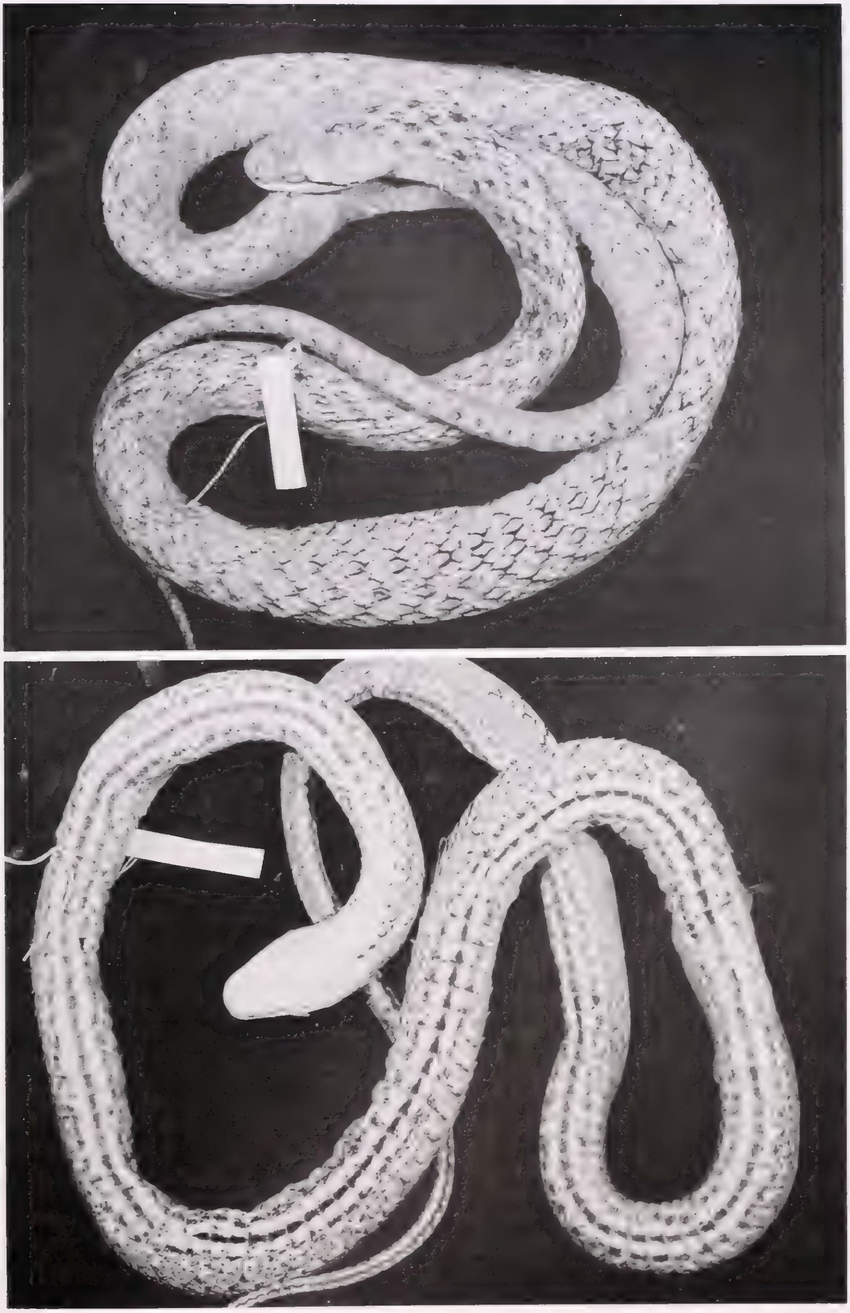

Figure 27. *Liopholidophis infrasignatus* (Günther), lectotype (BMNH 1946.1.7.57) from "Ankafana, eastern Betsileo." Dorsal and ventral views.

82.2.25.59–64]), collected by Rev. W. D. Cowan. The largest of the two females, BMNH 1946.1.7.57, is here designated the lectotype (Figs. 27–28). Characteristics of these specimens are reported here in order of the series, 1946.1.7.56–58. These are the largest specimens of *infrasignatus* reported (Domergue, 1973, as "*thieli*") or studied herein, with measurements (mm) and proportions as follows (total length, tail length, tail length as a percentage of total): two females (904, 215, 24%; 920, 208, 23%), male (727+, 121+). Ventrals 155, 156, 152.5, in each case preceded by two preventrals. Subcaudals 71, 67, 46+. Dorsal scales in 19–19–17 rows. One preocular, two postoculars, and 2–2 temporals. Eight supralabials (4–5 touching eye); 10–10 (females) or 9–10 (male) infralabials. Divided anal. Maxillary teeth 21, 23, 23, followed by two enlarged, ungrooved fangs.

General dorsal color light brownish with occasional scattered darker flecks (nowhere dense). Indistinct light dorsolateral lines (most evident under fluid) on neck and anterior 20% of body. Thin dark postocular bar from posteroventral corner of eye, across penultimate supralabial, and ending on anteroventral corner of ultimate supralabial. Otherwise, supralabials light, immaculate (dorsal ground color encroaches onto ultimate one). Infralabials and gulars immaculate yellowish white. Venter yellowish white with dense series of dark spots and markings, increasing posteriorly (similar to variation within the RNP sample), tending to form midventral series or line in females; dark encroachment of dorsal color onto lateral edge of ventrals, and an indistinct series of spots laterally on ventrals (except male).

Diagnosis. Liopholidophis infrasignatus differs from members of the *sexlineatus* group in having 19–19–17 dorsal scale rows (vs. 17–17–15). It has a relatively short tail and low numbers of subcaudals compared to other members of the *stumpffi* group (Table 2). The dorsolateral light stripes are anteriorly on rows 5–6, by which *infrasignatus* differs from *lateralis* (rows 3–5) and *stumpffi* (rows 4–5). *Epistibes* differs from *infrasignatus* in having a relatively long tail and higher ventral and subcaudal counts (Table 2 and *epistibes* account).

Distribution. Scattered localities on the eastern escarpment and eastern edge of the high plateau, as shown on maps (for *Liopholidophis "thieli"*) presented by Domergue (1973:1398) and Glaw and Vences (1994:336). From at least the vicinity of Midongy Atsimo (23°35′S, 47°01′E) in the south (Appendix) to Antongil Bay (Nosy Mangabe) in the north (Domergue, 1973: 1409). Most localities appear to be upland sites, 600–1,200 m elevation. The Nosy Mangabe locality is <100 m (Domergue, 1973:1409), whereas the type locality for *infrasignatus* is possibly as high as 1,600 m (see "Remarks"). *Liopholidophis infrasignatus* appears to be widespread within the RNP, and turns up at most forested localities with sufficient sampling (known elevational range within the park approximately 800–1,150 m).

Description. The following description is based on examinaton of 19 females and 11 males, including syntypes of *Ptyas infrasignatus* Günther and the holotypes of *Dromicus baroni* Boulenger and *Liopholidophis thieli* Domergue; ranges of variation for size, tail proportions, and ventral and subcaudal counts incorporate data for *L. thieli* given by Domergue (1973:table II). Measurements, proportions, and scutellation are summarized in Table 2. Largest specimen the female lectotype (BMNH 1946.1.7.57), 920 mm total length, 208 mm tail length (23% of total); largest male (BMNH 1946.17.58, a paralectotype), 727+ mm total length, incomplete tail 121+ mm. Proportional tail length not strongly sexually dimorphic, 23–27% of total length in males, 21–24% in females. Dorsal scales smooth, in 19–19–17 rows; 0–2 apical pits on different scales within an individual. Scale row reduction from 19 to 17 rows by fusion of rows 3 + 4 (occasionally loss of row 4, and one instance of 4 + 5 fusion) at the level of ventrals 78–94 (N = 18). Ventrals 146–156 in males, 144–161 in females. Anal plate divided. Subcaudals 66–81 in males, 62–73 in females. Eight (rarely seven) upper labials with 4–5 touching eye. Lower labials usually 10–10 (N = 22), with other variants being 8–8 (1), 9–9 (1), 9–10 (4), and 10–11 (2), the first pair in contact behind the mental, 1–5 (occasionally 1–4) touching an anterior genial, 5–6 (occasionally 4–5) touching a posterior genial. Anterior genials shorter than posterior genials. Loreal present. Preocular single. Temporals 2 + 2 (rarely 1 or 3 anterior or posterior temporals).

Body slightly higher than wide; ventrolateral edge of body angulate. Head slightly wider than neck. Pupil round. Eye moderately large, its diameter slightly greater than the distance from eye to posterior edge of nostril ($\bar{x}$ = 1.21 ± 0.1; range = 1.06–1.44; N = 19).

Scattered pits present on head scales, most consistently and densely on circumorbital scales and on prefrontals and nasal; in some specimens, they are liberally sprinkled over most of the head plates and supralabials except for the central parts of the parietals and frontal.

Dentition. Maxillary teeth 20–25 + 2 (N = 28; $\bar{x}$ = 22.3 ± 1.38 prefang teeth). Diastema absent; gap <1 tooth width separating tooth row from enlarged fangs. Ungrooved fangs not offset from tooth row, twice as large as the posteriormost maxillary teeth; having a rounded anterior surface (except for distal portion, which has a cutting edge) and a flattened knifelike posterior surface. The tips of the fangs are slightly compressed. The skulls of two females, MCZ 180357 and 180370, have, respectively, 14–14 and 15–16 palatine teeth, 30–28 and 30–30 pterygoid teeth, and 27–26 and 28–28 dentary teeth.

Hemipenis (Fig. 36). Deeply bilobed, noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Distal tips of the lobes with a central "umbelliform" depression.

*Coloration in Life (see Glaw and Vences, 1994:pl. 349 [*L. "thieli"*], which is similar to many specimens from the RNP).* MCZ 180355 (female): Dorsum olive brown, with indistinct indication of golden dorsolateral stripes anteriorly. Black postocular bar to corner of mouth, crossing middle of last two supralabials (see Domergue, 1973:fig. 6). Venter dull grayish yellow (tending to grayish white), with thin black longitudinal markings tending to form lines midventrally and ventrolaterally. Black speckling on outer edges of ventrals. A few dorsolateral black specks forming roughly two longitudinal rows just behind head (ca. 5–10 cm). Upper labials whitish, suffused with brown anteriorly. Lower labials whitish.

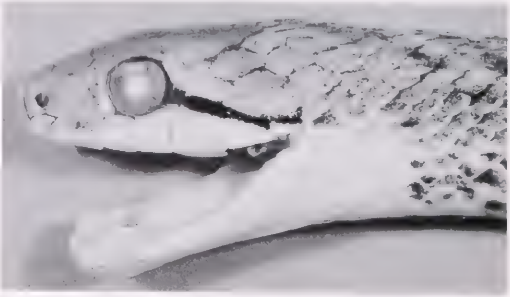

Figure 28. *Liopholidophis infrasignatus* (Günther). Lateral view of head of lectotype (BMNH 1946.1.7.57).

MCZ 180354 (male): Similar to MCZ 180355, but with orange wash on venter, especially posteriorly. Ventral dark marking forms midventral dark line on most of body and tail.

The dorsal ground color in the RNP sample ranges from dull grayish to olive brown to rich golden brown. Some dorsal scales, especially medially on the anterior body, have white scale borders similar to those in *stumpffi*, *epistibes*, and *lateralis*; these do not appear as constant or as vivid in *infrasignatus* as in these other species. The postocular bar usually crosses the last two supralabials but sometimes ends on the penultimate one; often there is a separated extension on the ultimate supralabial (Figs. 23, 28) The dorsolateral light stripes may be evident primarily on the anterior part of the body, most of the body, or they may be rather indistinct. Most specimens have some indication of black spots dorsolaterally on the anterior trunk (usually occupying one dorsal scale or less); these usually fade by midbody but occasionally are present the length of the body. A ventral orangish wash is characteristic of many specimens.

Coloration in Preservative. Grayish brown to grayish olive dorsal ground color, usually with some indication of dorsolateral light stripes anteriorly. Dorsolateral stripes anteriorly on rows 5–6, not confluent with light color of throat (Fig. 23), usually fading by midbody. A blackish postocular stripe from the eye to the corner of the mouth is universally present, and dark punctations are sometimes present on the dorsum, especially anteriorly. Supralabials whitish except dorsally, where the dorsal ground color encroaches; infralabials and throat region whitish. Venter dull white with dark grayish black peppering, spotting, or streaking, usually forming a continuous dark midventral line (Figs. 27, 29; see also Domergue, 1973:fig. 7). Dark grayish pigment usually encroaches upon the venter from the flanks, occasionally reaching the midventer, and sometimes forming a broken dark line on the lateral edges of the venter; in some specimens, most of the venter is dark gray, but the midventral line is usually still evident in such specimens. Smaller specimens tend to have light venters, suggesting an ontogenetic component to development of the ventral pigmentation. The stratum corneum is easily lost in preservative, giving a grayish cast to the dorsum.

Natural History. Liopholidophis infrasignatus is diurnal and terrestrial. This was the most frequently encountered diurnal snake in forested areas of the RNP, usually active or sunning on trails from early morning to later afternoon; it was found in primary montane rainforest, 900–1,050 m, and in one higher elevation (1,130 m) short-stature forest, but not in secondary forests or open habitats. Other species, such as *L. sexlineatus* and *L. lateralis,* are possibly numerically more abundant in open habitats such as rice fields, marshes, and secondary forests.

Liopholidophis infrasignatus bites in defense and also dorsoventrally flattens the anterior portion of the body. Domergue (1973:1409) reported neck flattening, as well as inflation of the body to reveal white borders of the dorsal scales.

Four *Liopholidophis infrasignatus* contained one food item each, all swallowed head first: MCZ 180370 (SVL 552 mm) contained the hind limbs of a large *Plethodontohyla inguinalis,* a large terrestrial microhylid frog; MCZ 180373 (SVL 216 mm) and MCZ 180374 (SVL 330) each contained remains of *Plethodontohyla alluaudi,* a small terrestrial microhylid; MCZ 180359–60 (food regurgitated into a common collecting bag) (SVLs 461 and 432 mm, respectively) contained a *Chamaeleo nasutus.* Domergue (1973) reported frogs in the diet of *Liopholidophis "thieli"* (=*infrasignatus*).

Four females in the RNP sample were gravid: MCZ 180370 (SVL 552 mm), collected 21 December contained small yolking follicles; MCZ 180372 (SVL 530 mm), collected 20–23 November, and MCZ 180356 (SVL 555 mm), collected 10 December, contained six and three, respectively, large, but nonoviductal yolking follicles; MCZ 180362 (SVL 609 mm), collected 19 December, contained nine shelled eggs, one of which contained an embryo in Zehr (1962) stage 18. Glaw and Vences (1994) reported that gravid females of *L. infrasignatus* (as *L. thieli*; locality not stated) collected in November laid six to seven eggs. Domergue (1973) reported six eggs in a female (SVL 546 mm) collected in November, a clutch of six laid by a female (SVL 593 mm) at the end of March, and a clutch of seven laid by a female (SVL 567 mm) in mid-November; all specimens were from Perinet, but details on captive maintenance were not given.

Remarks. The type locality of *Ptyas infrasignatus,* Ankafana (=Ankafina), is a regional name for a forest just west of Tsarafidy (Carleton and Schmidt, 1990) near the eastern edge of the high plateau. It lies at approximately 1,600 m elevation ac-

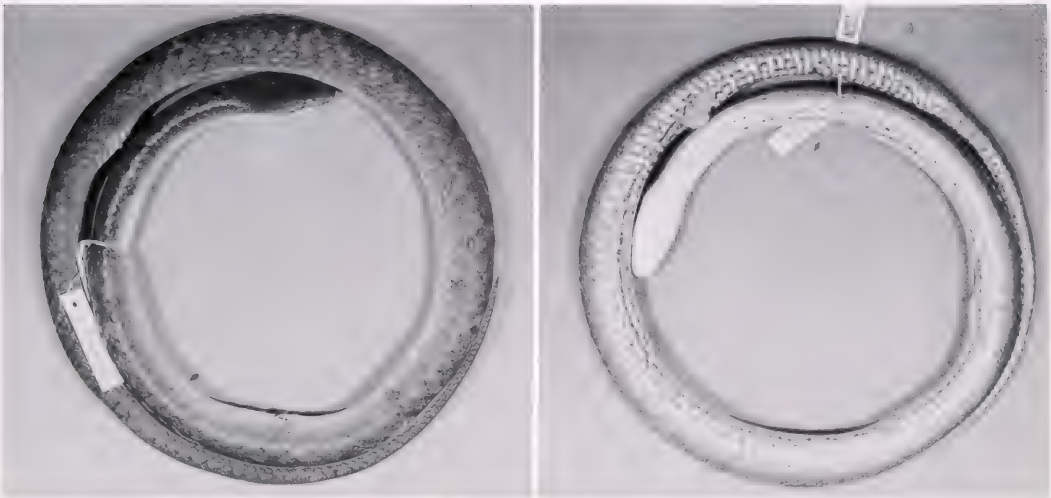

Figure 29. *Liopholidophis infrasignatus* (Günther). Dorsal and ventral views of specimen from the RNP (MCZ 180359).

cording to MacPhee (1987).[12] Other recent specimens of *Liopholidophis infrasignatus* have come from the same vicinity (Domergue, 1973:1405; two specimens of "*thieli*" in table II from Tsarafidy). Raxworthy and Nussbaum (1994:8) cited MacPhee (1987:5) as the authority that the correct name for this locality is "Ankafina," not "Ankafana," based on the designation in descriptions of small mammals collected by Cowan at this locality. However Carleton and Schmidt (1990) used the two names interchangeably. Boulenger (1893:247) corrected Günther's (1882) erroneous designation "Arkafina" to "Ankafana." Cowan (1883) himself was probably responsible for the confusion: in the text he refers at least twice to the locality as "Ankafana" (e.g., p. 147), but on the accompanying map it is plotted as "Ankafina."

Domergue (1973) reported occasional presence of two apical pits in *Liopholidophis "thieli."* I noted the presence of 0–2 apical pits, the number highly variable within and between individuals. Parker (1925:391, footnote) observed much variation in apical pit occurrence in species of the *stumpffi* group; he noted that one of the three syntypes of *infrasignatus* had apical pits (number not stated), whereas the other two lacked them.

Domergue (1973) reported that the Malagasy name *Menamaso* ("orange eye") was used for *Liopholidophis "thieli"* in the Perinet region, in reference to the often-orangish coloration of the iris. The name *Mandodrano* is used in the RNP area.

Notes on Type Specimens of Junior Synonyms. Because I resurrect the name *Ptyas infrasignatus* from synonymy and place two names as new synonyms of it, I here provide notes on the relevant type specimens of junior synonyms. References are given in the synonymy.

1. *Dromicus baroni* Boulenger (holotype, BMNH 1946.1.7.67 [old number 87.12.22.38], adult female): Total length 734 mm; tail length 167 mm; tail as a per-

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[12] The elevation is 1,300–1,540 m according to Raxworthy and Nussbaum (1994). The FTM 1:1,000,000 map shows a peak at this locality of 1,679 m. On Cowan's (1883) map, Tsarafidy is denoted as "Itsafidy."

centage of total length, 23%. Ventrals 158 (+2 preventrals), subcaudals 69, one preocular, two postoculars, 2–2 temporals. Supralabials 8–8 (4–5 touching eye), right infralabials 10 (left side damaged). Dorsal scales ?–19–17. Maxillary teeth 24 + 2. Dorsum dark grayish or greenish black, somewhat lighter anteriorly; tail not differentiated in color. Vague indication of some darker spots or markings when specimen under fluid, but this is subtle; anteriorly, there are dark spots on the neck, forming indistinct reticulated pattern, but no light dorsolateral stripes are evident. Each dorsal scale very finely speckled with light yellowish spots, giving overall velvety appearance ("powdered with yellowish"; Boulenger, 1888:104). Black postocular bar extending diagonally down across last supralabial. Otherwise, supralabials white (some grayish suffusion on anterior one or two). Infralabials and gular region white. Dorsal pigment encroaches onto outer 20–25% of each ventral edge; medial to this and not cleanly separated is a series of large irregular dark splotches (one pair per ventral); midventrally, a series of oblong dark spots forms a more or less continuous midventral line (see Boulenger, 1888:pl. V, fig. 5). Posteriorly on venter, dark pigment increases; underside of tail mostly dark (concentrated midventrally, lighter laterally).

The type of *Dromicus baroni* has an unusual coloration and pattern from other *Liopholidophis*, and its placement in the synonymy of *Ptyas infrasignatus* is provisional. Based on coloration, the specimen could be considered a rather unusual variant of either *infrasignatus* or of *stumpffi sensu lato*, where *baroni* has previously been placed (e.g., Boulenger, 1898) (*epistibes* in this work). (Interestingly, the holotype of *L. thieli* [=*infrasignatus*] shows fine stippling of yellowish similar to, but less distinct than, that of *baroni*.) However, unlike all other specimens of either *infrasignatus* or *epistibes* studied, the type of *baroni* has no indication of light dorsolateral stripes, and none was mentioned in the original description (Boulenger, 1888). The proportional tail length (23% of total) and subcaudal counts (69) of *baroni* are within the range of other *infrasignatus* females and considerably outside the range of *epistibes* females (see Table 2). The position of the postocular dark stripe extending diagonally downward across the last supralabial, rather than across its upper border, is also typical of *infrasignatus* rather than *epistibes* (cf. Figs. 8, 23, 28). Hence, the name *baroni* is synonymized with *infrasignatus*. Its status should be reevaluated if additional specimens with precise locality data and having the unusual coloration of *baroni* are discovered.

2. *Liopholidophis thieli* Domergue (holotype, MNHN 1971-332, adult male with everted hemipenes): Total length 695 mm; tail length 169 mm; tail as a percentage of total length, 24%. Ventrals 144 (+2 preventrals), subcaudals 69, anal divided; one preocular, two postoculars, 2–2 temporals. Supralabials 8–8 (4–5 touching eye), infralabials 10–10. Dorsal scales 19–19–17; dorsal reduction by fusion of rows 3 + 4 at ventrals 75–72. Maxillary teeth 24 + 2; no diastema. All of these values are typical of *infrasignatus* (Table 2).

The coloration of the type of *thieli* is identical to that already described for *infrasignatus*, although it appears somewhat darkened, perhaps as a preservation artifact. The venter of MNHN 1971-332 is strongly patterned, with a median and a lateral series of irregular half-moon–shaped blotches, as well as other irregular spotting. This pattern is within the range of variation observed in the RNP sample of *infrasignatus*.

Although Domergue (1973) properly resurrected *Liopholidophis stumpffi* (Boettger) from the synonymy of *L. lateralis*, failure to examine type material of previously described nominal taxa caused confusion of two species under the name *stumpffi*, discussed earlier, as well as resulting in the description of *thieli* for a previously described taxon. Direct comparison of the types reveals that *Liopholidophis thieli* Domergue, 1973, is identical with *Ptyas infrasignatus* Günther, 1882,

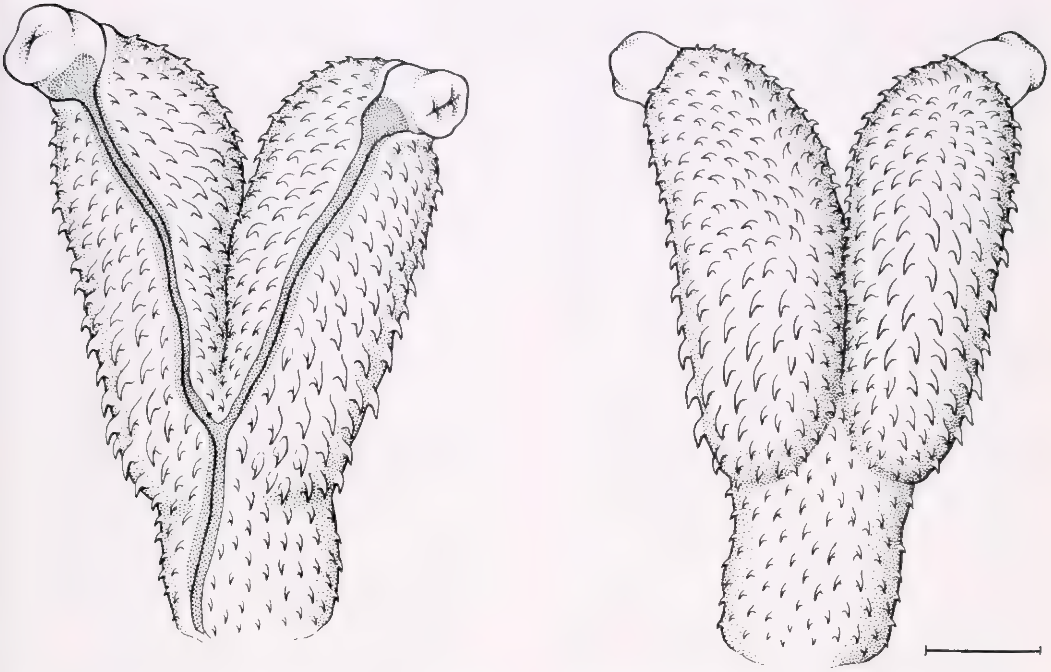

Figure 30. Hemipenis of *Liopholidophis rhadinaea*, new species. Fully everted organ of MCZ 180394 (from Talatakely in the RNP), shown in sulcate (left) and asulcate (right) views. Scale bar = 1 mm.

a species variously subsumed under *lateralis* or *stumpffi* for more than a century (Günther, 1890; Boulenger, 1893; Mocquard, 1909; Parker, 1925; Guibé, 1954, 1958). Hence, *thieli* Domergue is a junior synonym of *infrasignatus* Günther.

HEMIPENIAL MORPHOLOGY IN *LIOPHOLIDOPHIS*

Everted hemipenes of all currently recognized nominal species of *Liopholidophis* are described here. Brief comparisons to the corresponding inverted organs are given for some taxa as necessary.

The *sexlineatus* Group

Liopholidophis rhadinaea *(Fully Everted Left Organ of MCZ 180394; Fig. 30).* The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), with small cylindrical awns at the tips of the lobes (described later) and a deeply bifurcate centrolineal sulcus spermaticus. Total length of the everted organ approximately 6.5 mm, bilobed for the distal 2.5 mm. Sulcus spermaticus forked distally for 3 mm. No basal pockets or lobes.

The sulcus spermaticus is a deep groove, bifurcate for about ½ its length, with the branches terminating on the same side of the organ at the base of the apical awns (centrolineal in orientation). The tip of each branch broadens slightly, resulting in funnel-shaped distal end of each branch.

The stalk of the organ below the lobes is covered on all sides with small hooked spines. The stalk abruptly broadens slightly just below the sulcus division, the spines also coincidently increasing in size (spines here about twice as large as those on the base of the stalk). The lobes, including the crotch and inner and outer surfaces, are covered with hooked spines up to the distal tips of the branches of the sulcus. The spines are arrayed more or less in longitudinal rows.

Distally, beyond the tips of the branches of the sulcus spermaticus, each lobe has a nude, cylindrical projection (*cylindrical awn*), each somewhat <1 mm in length (i.e., considering only the nude portion); the distal tip of each awn is more or less flat but is slightly dimpled. These awns are not set off from the tips of the lobes except in lacking ornamentation (nude) and in projecting beyond the ends of the sulcus tips.

Dowling (1959) and Dowling and Savage (1960) used the term *awn* for elongate, pointed projections from the apex of colubrid hemipenes. My use of the term *cylindrical awn* for the structures in *Liopholidophis rhadinaea* suggests a different shape but does not necessarily imply homology with those as seen, for example, in *Tropidoclonion* (Dowling, 1959). *Liopholidophis dolicocercus* (see later) has tapered apical structures similar to, but less differentiated than, those of *L. rhadinaea*. The form of the apical structures in *rhadinaea* are unique among known colubrid hemipenes.

Although the awns on the hemipenes of *rhadinaea* might be construed as an artifact of overeversion, two other specimens with well-everted organs (MCZ 180392, 180396) had similar ornamentation, whereas a specimen with clearly uneverted tips to the lobes (MCZ 180402) does not show these structures. To more fully characterize these peculiar structures, the ventral lobe of an inverted hemipenis (MCZ 180389) was slit midventrally and examined *in situ*. The hemipenis extends to the level of the suture between subcaudals 6–7. The awn appears as a nude region (slightly >1 subcaudal scale in length) beyond the spinous portion of the lobe. The sulcus, in the dorsolateral wall of the lobe, ends in a slight expansion at the proximal end of the nude region.

Liopholidophis dolicocercus *(Fully Everted Right Organ of MCZ 180405; Fig. 31).* The organ is deeply bilobed, noncapitate, and acalyculate (entirely spinose). Sulcus spermaticus deeply bifurcate, centrolineal. Total length of the everted organ 19 mm, bilobed for the distal 10.5 mm. Sulcus spermaticus forked distally for approximately 9.5–10 mm. No basal pockets or lobes.

The sulcus spermaticus is a deep groove, forked for about half of its length, the branches passing distally on the same side of the organ (centrolineal). Distal tips of the forks not expanded, ending at edge of an apical nude area.

Stalk of organ below the lobes on sulcate surface ornamented with tiny hooked spines; these are arrayed in a few rows paralleling the basal undivided part of the sulcus, and with spines generally covering the stalk to one side of the sulcus. "Lateral" surface of stalk between sulcate and asulcate surfaces largely nude (a few scattered small spines).

The asulcate surface of stalk has a median patch of spines from near the base of the organ nearly to the point at which the organ divides. A highly unusual feature of this patch is that each spine appears to be recessed within a small pocket.

Distal to division of the organ, the facing surfaces of the lobes are closely appressed and nude (as seen by prying the lobes apart), but distally the facing surfaces diverge and are ornamented with spines on all sides.

At the level of the division of the sulcus spermaticus, the body of the organ is abruptly expanded (from a width of approximately 4.5 mm to approximately 8.5 mm). Concomitantly, the size of the spines abruptly increases, although toward the tips of the lobes spines again gradually become smaller. The narrow, distal portion of each lobe (especially on asulcate side and "crotch" side) is only sparsely covered with tiny spines. Tips of the lobes nude and with a median dimple.

The narrow distal portions of the hemipenial lobes in *Liopholidophis dolicocercus* appear similar to the apical awns of *L. rhadinaea*, with two exceptions (cf. Figs.

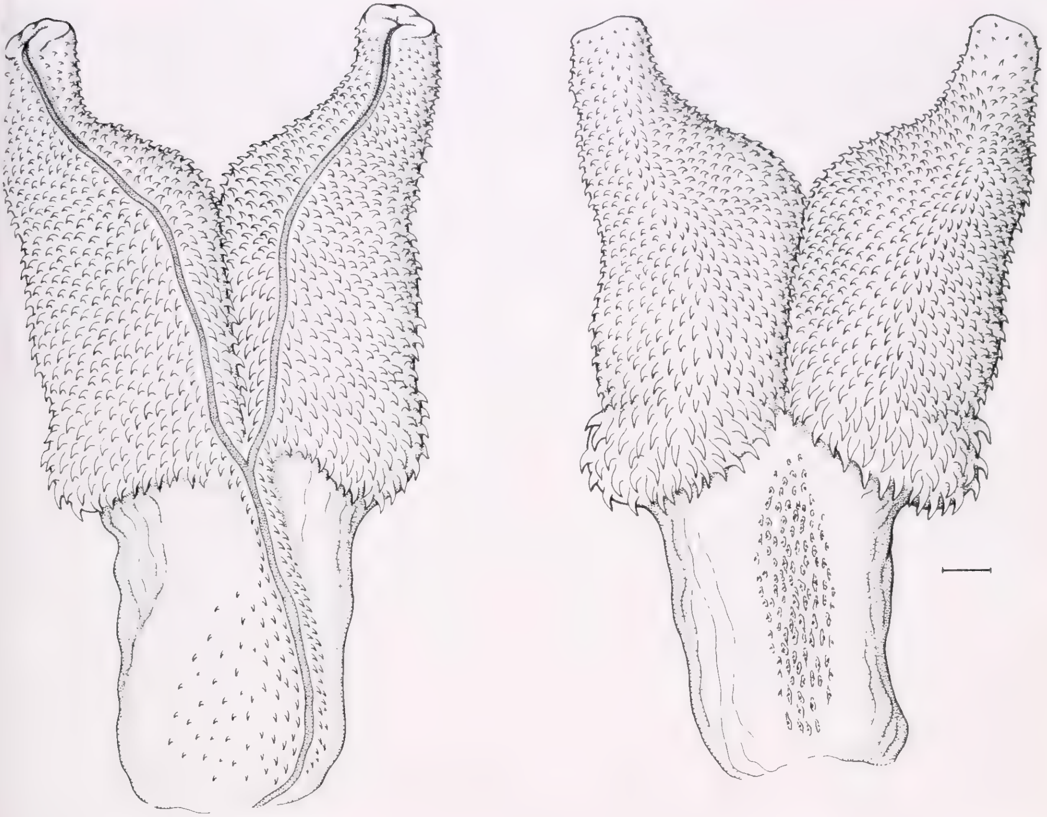

Figure 31. Hemipenis of *Liopholidophis dolicocercus* (Peracca). Fully everted organ of MCZ 180405 (from Talatakely in the RNP), shown in sulcate (left) and asulcate (right) views. Scale bar = 1 mm.

30–31): (1) in *dolicocercus* the narrow portion has a sparse covering of tiny spines (nude in *rhadinaea*) and (2) the unexpanded tips of the sulcus spermaticus extend to the edge of the distal nude area in *dolicocercus,* whereas in *rhadinaea* the tips of the sulcus are expanded and end at the base of the apical awns.

Liopholidophis grandidieri *(Fully Everted Right Organ of MCZ 180297; Fig. 32).* The organ was nearly completely everted upon preservation but subsequently everted fully using the technique of Pesantes (1994).

The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), and with a deeply bifurcate centrolineal sulcus spermaticus. The organ is 11 mm total length, bilobed for the distal 5 mm. The sulcus spermaticus is bifurcate for the distal 6 mm. No basal pockets or lobes are present.

The sulcus spermaticus is a broad, deep groove, forked for about ½ of its length, with the branches passing distally on the same side of the organ (centrolineal). Distal tips of the forks not expanded, ending at the distal tips of the lobes.

Entire organ ornamented with hooked spines, smallest on the lobes, with an array of larger spines encircling the organ at the point where the lobes join (approximately 8–10 enlarged spines around base of each lobe from sulcus to middle of asulcate side).

Spines sparser on extreme distal tips of the lobes than the adjacent proximal portions. Spines sparser in a band around the middle of the organ (immediately proximal to the lobes) than on the base of the stalk or on the lobes. A small nude area is present on each "lateral" surface of stalk just proximal to the union of the lobes. Base of stalk with small dense arrays of spines on all sides, somewhat larger and less dense on asulcate than on sulcate side.

The stalk of the organ is of uniform width (i.e., no abrupt expansion, as seen in *dolicocercus* and *rhadinaea*). After division of the organ, the lobes diverge gradually and are densely ornamented with spines on all sides.

Liopholidophis sexlineatus *(Fully Everted Right Organ of MCZ 180337; Fig. 33).* The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Total length of the everted organ approximately 10 mm, bilobed for the distal 4 mm. Sulcus spermaticus forked distally for 4.5 mm. No basal pockets or lobes.

The sulcus spermaticus is a deep groove, bordered by thickened, overhanging lips; bifurcate for about ½ its length, with the branches terminating abruptly about 1.5 mm short of the tips of the lobes on the same side of the organ (hence, centrolineal). Basal undivided portion of sulcus spermaticus bordered on either side by dense array of small hooked spines. Subsequent to division of the sulcus, these spines become gradually larger to approximately the midpoint of the lobes, then decrease in size toward the tips of the lobes.

The basal ½–⅔ of the stalk on the asulcate side bears a patch of small hooked spines; distal half of the stalk on the asulcate side is sparsely ornamented with spines, with large more or less nude areas. "Lateral" surface of stalk between the asulcate spinous portion and the sulcus is mostly nude (a few scattered spines, mostly concentrated proximally). Proximal portion of the asulcate and "lateral" surfaces of each lobe with approximately 12 somewhat enlarged hooked spines; more distal portion of lobes entirely spinose with smaller spines. The facing surfaces of the lobes are entirely spinose, but the crotch has a small nude area between the lobes; on the asulcate side, the nude area in the crotch separates the enlarged spines encircling the base of each lobe from the corresponding spines of the other lobe.

Beyond the distal tips of the branches of the sulcus spermaticus the lobes have a somewhat unusual ornamentation, which is restricted to the apex of the sulcate side (i.e., not encompassing the apex on the asulcate side, which is simply spinose as just described). The apexes bear 8–10 enlarged papillae or folds, each capped by a single spine that is approximately the same size as spines on the adjacent, nonpapillate portions of the lobes. Between the papillae, the organ appears nude. The overall effect of this ornamentation under low magnification is to give the apexes of the asulcate surface a somewhat rugose appearance.

The papillae on the hemipenis of *Liopholidophis sexlineatus* are not similar to the "apical papillae" described by Dowling (1959), which are merely pointed, awnlike structures at the tips of some colubrid hemipenes (one per lobe). However, they are somewhat similar to the spinulate papillae on the lobes of *Psomophis* hemipenes (Myers and Cadle, 1994:13). Unlike *Psomophis*, in which enlarged papillae are capped by minute spinules, the papillae of *L. sexlineatus* are capped by a spine approximately the same size as other distal spines on the organ. Based on the minuteness of the spinules and seemingly weak mineralization of some papillae when micromanipulated, Myers and Cadle (1994: 13) hypothesized that the spinulate papillae on *Psomophis* hemipenes were derived from fully mineralized spines. Such a derivation seems less likely for the spinose papillae of *L. sexlineatus*, in which the spines on the papillae are not noticeably smaller than other distal spines. The diversity of apical structures in the *sexli-*

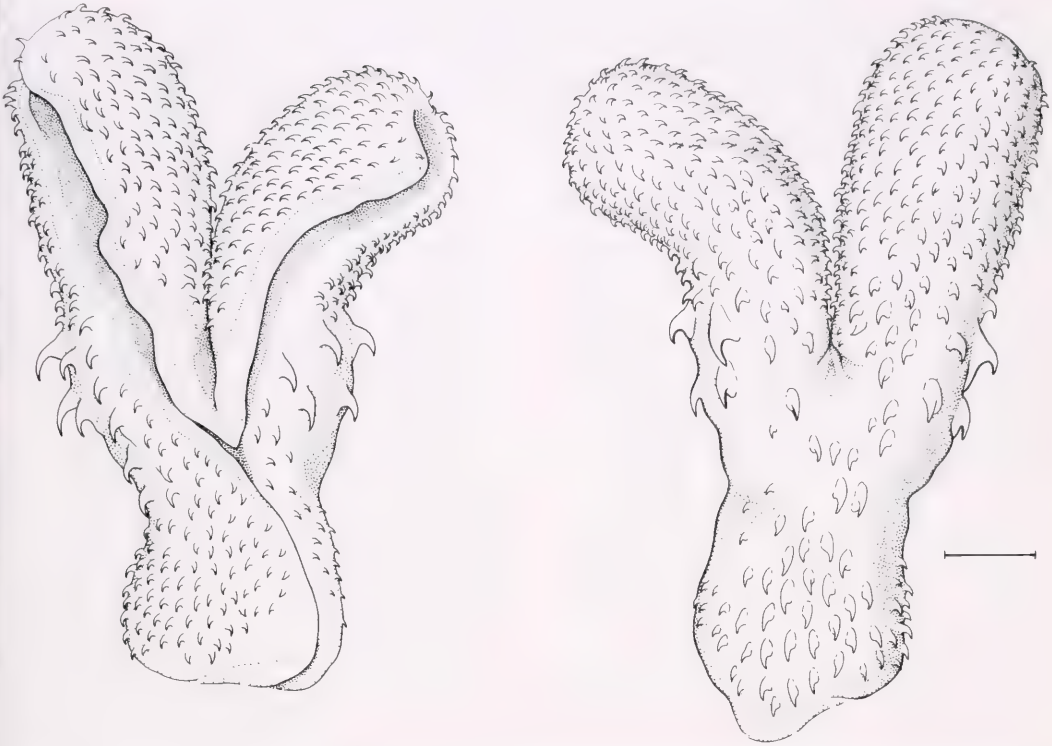

Figure 32. Hemipenis of *Liopholidophis grandidieri* Mocquard. Fully everted organ of MCZ 180297 (from Mt. Maharira in the RNP), shown in sulcate (left) and asulcate (right) views. Scale bar = 1 mm.

neatus group (cf. *rhadinaea* and *dolicocercus*) makes the homology and origin of these structures difficult to discern with present knowledge.

Liopholidophis pinguis *(Everted Right Organ of MCZ 11701, Prepared from the Inverted Organ by the Method of Pesantes [1994]).* Before the organ was removed, it extended to approximately the middle of subcaudal 9 and bifurcated at the level of the suture between subcaudals 5 and 6. The major retractor muscle divides at about the base of subcaudal 11. The ventral lobe of the left hemipenis was examined *in situ* by making a midventral incision.

The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Total length of the everted and injected organ approximately 15 mm, bilobed for the distal 6.5 mm. Sulcus spermaticus forked distally for 10 mm. No basal pockets or lobes. Stalk and lobes narrow, with no abrupt expansions. No especially enlarged spines anywhere on organ.

The sulcus spermaticus is a broad, deep groove, bordered by thickened, overhanging lips; bifurcate for about ⅔ its length, with the branches terminating at the tips of the hemipenial lobes on the same side of the organ (centrolineal). There seems to be slight displacement of the branches toward the outer sides of the lobes, but this may be an artifact of the preparation method; the sulcus in the opened lobe of the inverted organ was on the lateral side of the lobe, as typical for centrolineal sulci.

Basal undivided portion of sulcus bordered on either side by dense array of short, thick, curved spines. Similar spines line the outer border of the sulcus from the base to the tip, and the mesial border of the forks of the sulcus beginning at the fork; the latter are continuous with the spinous portion of the lobes, and afford the only continuity between the spinous portions of the lobes. Spines are short spikes sitting atop a broad base. Subsequent to division of the sulcus, the spines become gradually larger to approximately the midpoint of the lobes, then decrease in size toward the tips of the lobes. There are no abruptly enlarged spines. The inner side of the crotch of the organ nude for approximately 25% the length of the lobes, as is the mesial portion of the stalk of the organ between the division of the sulcus and the crotch of the organ. Spinous portions of lobes mesially entirely separated by nude area in crotch.

Asulcate side of stalk with sparse covering of short hooked spines; crotch of organ on asulcate side nude. Body of lobes on the asulcate side with dense array of spines, longest proximally, gradually decreasing in size distally; a short, nearly nude section at base of each lobe has only a few scattered spines. Extreme distal tip of lobes more or less nude (scattered, very minute spines). Stalk of the organ between asulcate spinous portion and spines bordering the sulcus (i.e., the "sides" of the organ) is nude.

The apexes of the lobes of the everted organ were punctured during preparation, but configuration of distal structures was confirmed by examination of the inverted organ of the same specimen. The sulcus extends to the tip of each lobe, which is more or less nude. No peculiar apical structures, as seen in *dolicocercus* and *rhadinaea*, are apparent.

The *stumpffi* Group

Liopholidophis epistibes *(Fully Everted Left Organ of MCZ 180318; Fig. 34).* The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Sulcus spermaticus divides approximately 3 mm from the base of the organ. The lobes diverge strongly from one another, essentially lying at right angles to the stalk. Thus, the distal face of the hemipenis is formed by the surfaces of the lobes that would normally face one another (i.e., the crotch) if the lobes were not so divergent. The tips of the lobes face away from one another at nearly right angles to the axis formed by the crotch and basal stalk. No basal pockets or lobes.

The sulcus spermaticus is a deep groove, bifurcate for about ¾ its length, the branches terminating just short of a central depression at the tip of the lobes. The orientation of the sulcus is therefore centrolineal, even though the lobes themselves diverge at nearly 180° from one another.

The stalk of the organ is very short and ornamented with scattered minute spines. The base of the lobes is encircled by 3–4 rows of enlarged spines on an expanded midsection of the stalk (>30 enlarged spines around base of each lobe); the midsection is set off from the short basal portion of the stalk by a distinct nude shelf. On the sulcate side, the enlarged spines of the midsection approach the sulcus spermaticus at its point of division. On the asulcate side, the spines follow the periphery of the lobes distally, becoming rather abruptly smaller as the lobes turn away from the stalk. The crotch of the organ, including most of the mesial surfaces of the lobes, is nude except for an array of tiny spinules encircling the distal rim of the lobes. The asulcate surface between the lobes is nude, as is a broad expanse of tissue between the spinous midsections.

The distal tips of the lobes have a deep central "umbelliform" depression where the retractor muscle attaches internally (see later). These distal surfaces are ornamented with a sparse array of very tiny spinules, arranged in rather indistinct concentric rows.

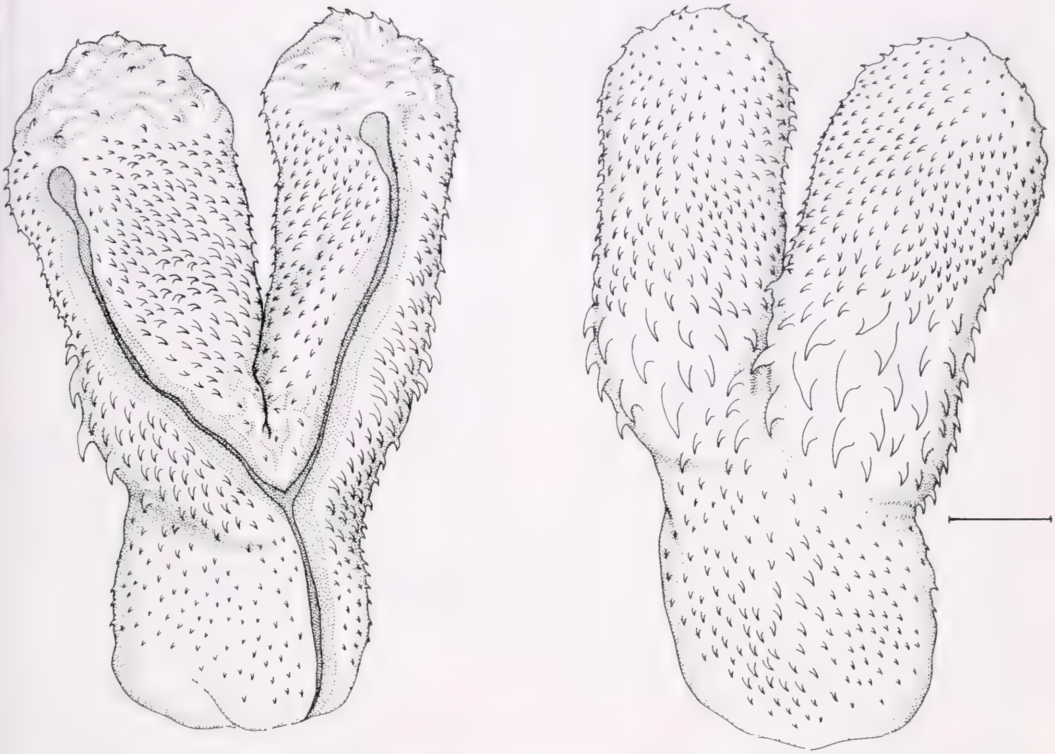

Figure 33. Hemipenis of *Liopholidophis sexlineatus* (Günther). Fully everted organ of MCZ 180333 (from Ambatolahy near the RNP), shown in sulcate (left) and asulcate (right) views. Scale bar = 1 mm.

Liopholidophis stumpffi. The following description is based on the right organ of FMNH 18219, a topotype. The inverted organ was studied superficially *in situ,* before removal and eversion using the method of Pesantes (1994). Although the eversion was successful, the tissue probably is not as expanded as would be an organ everted from a fresh specimen. Thus, although details of ornamentation are easily discernible, the overall shape of the organ, which has rather narrow, unexpanded lobes, would probably be more similar to that described earlier for *epistibes.*

Before removal, the organ extended to the level of the suture between subcaudals 8 and 9, bifurcating at the level of the suture between subcaudals 2 and 3 (hence, having a short stalk and long lobes). The everted organ is approximately 12 mm total length, bilobed for the distal 9–10 mm (about ¾ bilobed). The sulcus is centrolineal, dividing about 3 mm from the base of the organ. The lobes diverge from one another but may to a greater extent in a naturally everted organ. No basal pockets or lobes. Overall, the organ is deeply bilobed, noncapitate, and acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus.

The sulcus spermaticus is a deep groove, bifurcate for about ¾ its length, the branches terminating at a central depression at the tip of the lobes on the same side of the organ. The orientation of the sulcus is therefore centrolineal. The distal depression of the lobes would likely assume the "umbelliform" shape seen in other members of the *stumpffi* group if the lobes attained full expansion. The umbelliform area appears to have scattered minute spines in an otherwise nude area.

The stalk of the organ is very short, ornamented with scattered minute spines. At the base of the lobes, their outer surface has three to four enlarged hooked spines more or less in a curved line around the outer surface. Above the enlarged spines, the outer surface of each lobe is nude for a small area, above which the lobes are ornamented with spines for the distal ⅔ of their length. The enlarged spines are separated from the stalk by a nude shelf and a shallow groove. Except in having many fewer enlarged spines, the spinous midsection of the *stumpffi* hemipenis appears similar to that of *epistibes,* although not as expanded as it would probably in a fully inflated organ.

On the sulcate surface, the crotch of the organ has a narrow array of spines bordering the sulcus above its division; otherwise, the crotch is nude on that surface, as well as on the asulcate surface at the base of the lobes. The facing surfaces of the lobes are basally nude (i.e., in the crotch) for about ¼ of its length and spinose for the distal ¾. These spines are somewhat larger proximally, decreasing in size distally.

Liopholidophis lateralis. Domergue (1962:101–102, fig. 13; 1973:1410, fig. 3) briefly described and illustrated hemipenes referred to *Liopholidophis lateralis* but did not indicate the specimens upon which these were based. His two illustrations appear rather different: the earlier figure and description has more strongly divergent and less globose lobes than the later one. Whether this reflects variation or misidentified taxa is unclear (*stumpffi, epistibes,* and *thieli* were subsumed within *lateralis* when the 1962 paper was written); the strongly divergent lobes of the organ illustrated in the former paper suggest hemipenes of *L. epistibes,* as already described (but see later summary and comparisons). The *lateralis* hemipenis illustrated in 1973 is similar to organs of that species I have studied.

The following description is based on the fully everted right organ of MCZ 180380 (Fig. 35). The organ is deeply bilobed, noncapitate, and acalyculate (ornamentation consists entirely of spines), with a deeply bifurcate centrolineal sulcus spermaticus. Sulcus spermaticus divides approximately 4 mm from the base of the organ. The lobes diverge strongly from one another, creating overall a Y-shaped organ. The tips of the lobes face away from one another at somewhat >45° angles to the axis formed by the crotch and basal stalk. No basal pockets or lobes. The lobes of this preparation are slightly asymmetrical in size (Fig. 35), but this appears to be subject to some variation, as the left organ of the same specimen and several others examined do not show this asymmetry.

The sulcus spermaticus is a deep groove, bifurcate for about ⅔ its length, the branches extending to the tip of the lobes and terminating in a central depression at their distal tips. The thickened lips of the sulcus become closely appressed to one another, especially distally, essentially making a closed channel of the groove below the surface. At the distal end of the sulcus adjacent to the umbelliform depression, the channel of the sulcus spermaticus is ≥1 mm deep.

The stalk of the organ is short and ornamented with scattered minute spinules. Just proximal to the point of division of the sulcus, the stalk abruptly expands, forming a broad midsection from which the lobes extend. The midsection is set off by a distinct nude shelf from the proximal narrower portion of the stalk. The midsection is arrayed with enlarged hooked spines arranged in clusters: viewed from the sulcate side, a large spine occupies the lower corners of the expanded portion of the stalk, and a cluster of 6–8 medium-sized spines (distally grading into the smaller spines of the lobes) is adjacent to the point of sulcus division; on the asulcate

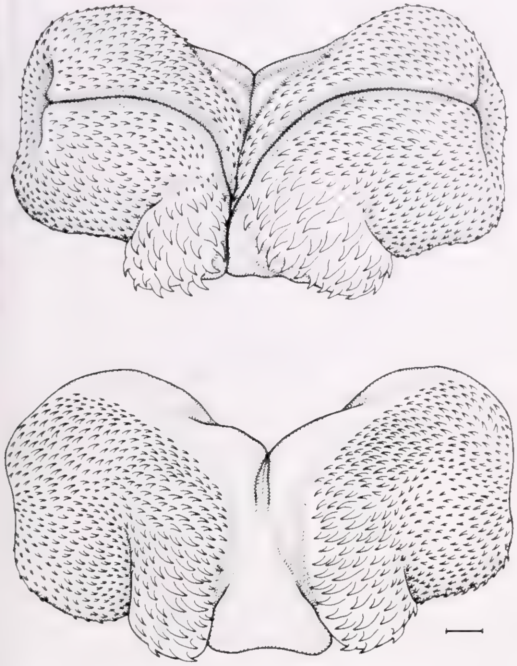

Figure 34. Hemipenis of *Liopholidophis epistibes*, new species. Fully everted organ of MCZ 180318 (from Talatakely in the RNP), shown in sulcate (top) and asulcate (bottom) views. The distal "umbelliform" tips to the lobes in the sulcate view appear to be normal features, rather than a result of incomplete eversion (see text: "Summary and Comparisons of Hemipenes of *Liopholidophis*"). Scale bar = 1 mm.

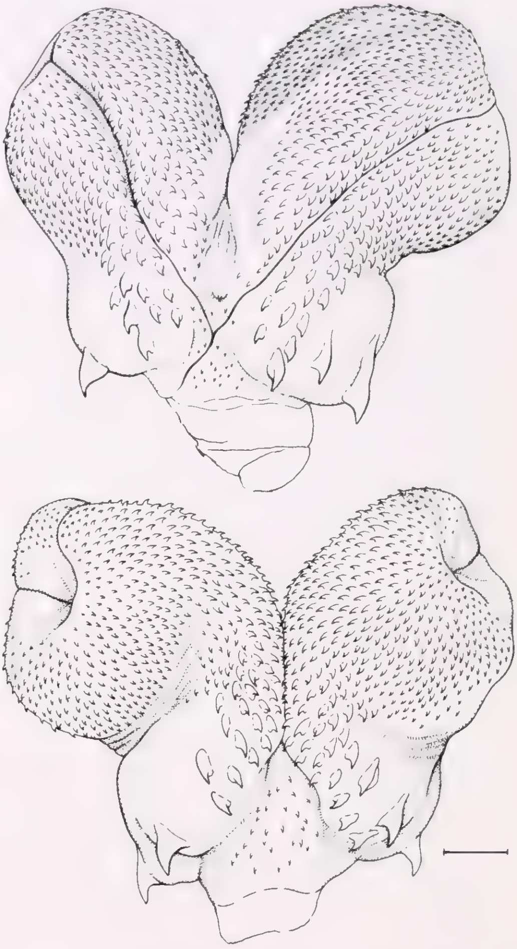

Figure 35. Hemipenis of *Liopholidophis lateralis* (Duméril, Bibron, and Duméril). Fully everted organ of MCZ 180380 (from near Midongy du Sud), shown in sulcate (top) and asulcate (bottom) views. The distal "umbelliform" tips to the lobes appear to be normal features, rather than a result of incomplete eversion (see text: "Summary and Comparisons of Hemipenes of *Liopholidophis*"). Scale bar = 1 mm.

side the midsections bear 10–12 enlarged hooked spines (larger proximally, smaller distally) that grade into the small spines on the lobes. Large areas of nude tissue occupy the midsections between the clusters of spines.

A few small spines are present in the fork of the sulcus. Small spines and spinules ornament the lobes except the nude central depression at their distal tips; a small wedge of nude tissue is in the crotch of the organ and adjacent basal facing portions of the lobes, forming a continuous stretch of nude tissue in the crotch between the asulcate and sulcate sides (i.e., the spinous areas of the lobes are not continuous with one another across the crotch).

As the lobes diverge from one another, their distal ends turn slightly toward the asulcate surface, so that more of the tips of the lobes is visible from the asulcate than from the sulcate side. Lobes, except for the distal depression, are entirely ornamented with small spines, which are larger proximally. The distal tips of the lobes are nude and have a deep central depression (described as "umbiliform" by Domergue, 1962:101) where the retractor muscle attaches to the inside of the lobes.

Liopholidophis infrasignatus. Domergue (1973:fig. 8) illustrated an everted hemipenis of *infrasignatus* (*"thieli"*). The following description is based on the fully everted right organ of MCZ 180368 (Fig. 36). The organ is deeply bilobed, noncapitate, and acalyculate (entirely spinose), with a deeply bifurcate centrolineal sulcus spermaticus. Total length approximately 15 mm, bilobed for the distal 4 mm. Sulcus spermaticus divides approximately 6.5 mm from the base of the organ. The lobes diverge slightly, and their distal tips face away from one another (see comments in later summary and comparisons). No basal pockets or lobes are present.

The sulcus spermaticus is a deep groove, bifurcate for somewhat more than ½ its length, the branches extending to the tip of the lobes and terminating in a central umbelliform depression.

The organ has a narrow stalk ornamented with scattered small spines and an abuptly expanded midsection proximal to each lobe. The expanded midsections have a battery of enlarged, hooked spines (15–20 on each midsection) more or less evenly distributed around the circumference of the organ. These spines are larger on the sulcate than the asulcate side, arranged roughly into two to three rows, and grade into the smaller spines of the lobes. On the asulcate side, the spinous midsections of either side are separated from one another by a nude gap in the crotch. The enlarged spines are separated by a shelf of nude tissue and a distinct groove (most prominent on the asulcate side) from the spinous stalk. The spines of the midsection grade into those of the lobes on the "lateral" surfaces of the organ, with an abrupt size transition at the juncture of the lobes and midsections.

The distal tips of the lobes have a deep central "umbelliform" depression. The lobes are ornamented with minute spines except distally, where a band of nude tissue encircles the umbelliform depression, and proximally in the crotch of the organ. Except for several minute spines within the fork of the sulcus spermaticus, the crotch of the organ is nude from the sulcus spermaticus to the spinous stalk on the asulcate side. The inner surfaces of the lobes (i.e., facing the crotch) are also nude except for a spinous band encircling the distal tips of the lobes (occupying the distal 15–25% of the facing surfaces of the lobes).

Summary and Comparisons of Hemipenes of *Liopholidophis*

Hemipenial morphology in the *sexlineatus* group is more heterogeneous than in the *stumpffi* group. Relative to body size, three species (*grandidieri, rhadinaea, sexlineatus*) have rather small organs, whereas *pinguis* is intermediate in size, and *dolicocercus* is large. *Liopholidophis dolicocercus*, *L. rhadinaea*, and *L. sexlineatus* have peculiar apical structures that are quite different from one another; the others have no such structures. The hemipenes of *sexlineatus* and *grandidieri* are the most similar pair in size and details of ornamentation (Figs. 32–33), but these are the most generalized organs of the series, lacking any especially distinctive features except for the spinose papillae on the lobes in *sexlineatus*.

In comparison to the *sexlineatus* group, hemipenes of species of the *stumpffi* group are more homogeneous but quite different from those of the *sexlineatus* group. Hemipenes of the *stumpffi* group have a relatively short basal stalk (essentially none in *epistibes* and *stumpffi*) compared to those of the *sexlineatus* group. The organ is about ⅓ bilobed in *infrasignatus*, about ½ bilobed in *lateralis*, and much more than ½ bilobed in *epistibes* and *stumpffi*. Hemipenes in the *sexlineatus* group are about 50% or less bilobed (greatest in *dolicocercus*), and all species in this group have a prominent stalk. The organs of the *stumpffi* group are also large relative to body size compared to all species of the *sexlineatus* group except *dolicocercus*.

Within the *stumpffi* group, the hemipenes of *stumpffi* and *epistibes* are more similar to one another in having a very

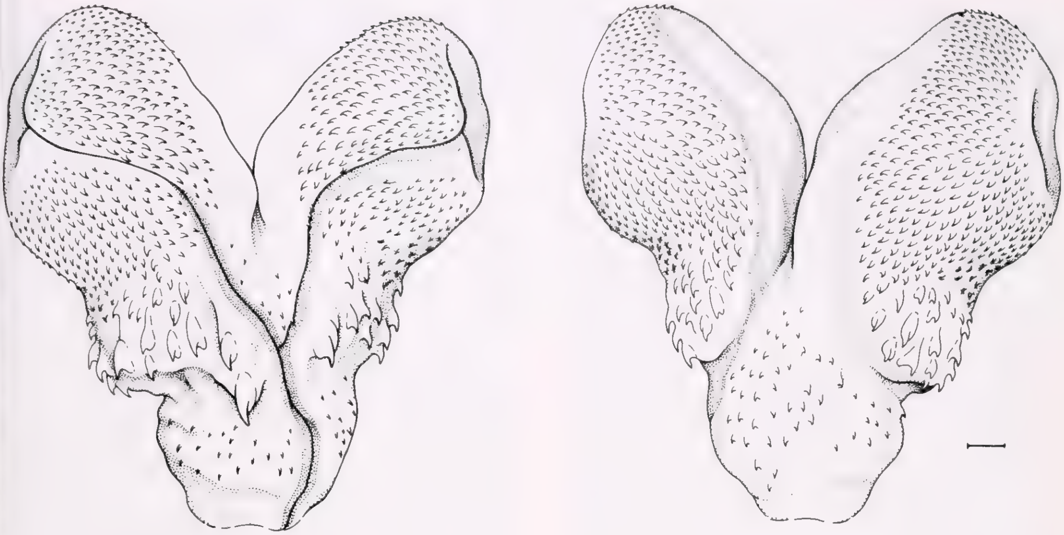

Figure 36. Hemipenis of *Liopholidophis infrasignatus* (Günther). Fully everted organ of MCZ 180368 (from Talatakely in the RNP), shown in sulcate (left) and asulcate (right) views. The distal "umbelliform" tips to the lobes in the asulcate view appear to be normal features, rather than a result of incomplete eversion (see text: "Summary and Comparisons of Hemipenes of *Liopholidophis*"). Scale bar = 1 mm.

reduced stalk, whereas *lateralis* and *infrasignatus* have organs of more typical proportions; the former condition is considered derived (see following section). On the other hand, the organs of *stumpffi* and *lateralis* are similar in having few enlarged spines on the midsection, whereas *infrasignatus* and *epistibes* have many enlarged spines in this area (cf. Table 3).

The overall form of the hemipenis of *epistibes*, with its lobes widely diverging so that the "crotch" of the organ actually forms its distal face, appears unusual but may be at least partly influenced by internal attachment and constraint by the retractor muscles. Such an effect is suggested by comparison of the organ of *infrasignatus* previously described with its partner, which was inflated with jelly while still attached to the specimen. The *infrasignatus* organ described earlier had lobes only slightly diverging, whereas its partner is similar to *epistibes* in having the lobes much more widely diverging.

Hemipenes of the *stumpffi* group are characterized by two unusual features that are discussed separately here.

(1) Presence of an "umbelliform" depression at the tip of the lobes. At first the depression appears to result from incomplete inflation of the hemipenis. However, it is a consistent feature of the hemipenes of all specimens of *epistibes, lateralis,* and *infrasignatus* I prepared in the field, despite a conscious effort to effect greater eversion. That the distal depression is not an artifact was proved by internal dissection of an everted organ of *L. lateralis* (MCZ 180347). The dissection revealed that the "dimpled" appearance results from broad internal attachment of the *M. retractor penis magnus* to the somewhat pleated tissue at the tip of the lobes. No "uneverted" tissue appeared to remain inside the organ, and I conclude that the umbelliform structure is a normal feature of these organs.

The umbelliform lobes of the *stumpffi*

group are unusual among colubrid hemipenes and here interpreted as a synapomorphy of the group (see "Monophyly of the Species Groups of *Liopholidophis*"). However, similar structures appear in hemipenes of some species of *Liophidium* (personal observations of *Liophidium rhodogaster,* and a description and illustration of the organ of *Liophidium vaillanti* ["L'apex . . . avec une dépression centrale" and fig. 5B in Domergue, 1983]). As already alluded to (description of *rhadinaea*), and as will be revisited later, generic limits of these and other Malagasy colubrids need reevaluation (see "Monophyly of *Liopholidophis*" and the discussion of MNHN 1988-331). Proper phylogenetic interpretation of the umbelliform lobes of the *stumpffi* group will only be possible with a broader survey of hemipenial morphology of other Malagasy colubrids. Nevertheless, the unusual nature of the umbelliform lobes in hemipenes of the *stumpffi* group are reasonably interpreted as a synapomorphy of the group at present.

(2) An expanded midsection of the hemipenial stalk, set off by a nude shelf and/or groove from the narrow basal portion of the stalk (less distinctly differentiated from the lobes). In the *stumpffi* group, the enlarged spines encircling the base of the lobes occupy this expanded midsection. Among other Malagasy colubrid hemipenes examined (representatives of *Geodipsas, Liophidium, Lycodryas, Mimophis, Dromicodryas, Madagascarophis,* and *Pseudoxyrhopus*), only *Pseudoxyrhopus tritaeniatus* had a expanded midsection somewhat similar to that in the *stumpffi* group. However, in *P. tritaeniatus,* the midsection is not as distinctly set off as in members of the *stumpffi* group. Because of the seemingly restricted taxonomic distribution of a differentiated spinose hemipenial midsection, I interpret this feature as a synapomorphy of the *stumpffi* group. Within the *stumpffi* group, a differentiated midsection seems least developed in *stumpffi* (although this interpretation is perhaps influenced by the eversion method of the organ studied; see earlier) and best developed in *infrasignatus* and *lateralis.* The midsection is not discrete in organs that are not well inflated and is easily overlooked, for example, in everted organs that are nonetheless flaccid.

In hemipenes of the *stumpffi* group, the nude shelf and/or groove delimiting the midsection is reminiscent of the overhanging shelf setting off the capitulum of those Neotropical colubrid hemipenes described as "capitate" ("xenodontines" *sensu lato*; see Myers, 1973:30–31, 1974:31; Myers and Campbell, 1981:15–17; Myers and Cadle, 1994:13–14). However, the capitation observed in the latter organs does not appear homologous with the condition seen in the *stumpffi* group,[13] as suggested by two features: (a) the midsection of hemipenes in the *stumpffi* group is set off by a less well-defined groove and shelf than is the capitulum in truly capitate organs, and (b) in truly capitate organs, the groove delimits a distinct, distal "capitulum" in the case of non-bilobed organs or, in bicapitate or semicapitate organs, a capitulum on each hemipenial lobe (in which case the overhang delimiting the capitulum is considerably distal to the division of the sulcus spermaticus). The differentiated midsection of hemipenes in the *stumpffi* group appears more closely associated with the stalk of the hemipenis, rather than with the lobes, and the delimiting groove and shelf are proximal to the division of the sulcus spermaticus.

One other feature of all hemipenes of *Liopholidophis* seems worthy of note. In comparison to a wide variety of other colubrids, the sulcus spermaticus of hemipenes of *Liopholidophis* seems unusually broad and deep, although I have been unsuccessful in quantifying the variation. In many colubrids, the sulcus spermaticus has a narrow opening on the surface of the hemipenis, is bordered by a very narrow (sometimes indistinct) lip, and appears as a line on the surface of the organ. In *Liopholidophis* (all species of both species groups), the sulcus has a broad surficial opening and is bordered by thickened lips; it appears as a deep, open trough except in some cases (as in *lateralis*, described earlier) in which the lips are appressed to one another and essentially form a closed canal. No similar structure was observed in hemipenes of other Malagasy colubrids, with the exception of several *Geodipsas* spp., which otherwise have quite different hemipenes from *Liopholidophis*. I offer neither a functional nor systematic interpretation of the unusual sulcus structure here but call attention to this apparently variable feature of colubrid hemipenes, which seems not to have been previously reported.

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[13] Some forms of capitation in Neotropical colubrids also have apparently been independently derived more than once. See Myers and Cadle (1994: 13–14 and references therein) for discussion.

OSTEOLOGICAL COMPARISONS

I have examined one skull each of the species *dolicocercus, grandidieri, pinguis,* and *rhadinaea,* and two skulls each of *epistibes, infrasignatus, lateralis,* and *sexlineatus* (Appendix). I have not seen a skull of *stumpffi*, and where I generalize to *Liopholidophis sensu lato* or to the *stumpffi* species group later, I am assuming that the characteristic under consideration is similar in *stumpffi* as in other species of its group (for species group characters) or for the genus as a whole (other characters). This should present no problem, as the skulls of the other species are rather homogeneous for those characters at the appropriate level of comparison.

A complete osteological description is not attempted here. I discuss only some salient characteristics of the genus; skull characters differentiating the species groups are presented in a later section (see "Monophyly of the Species Groups of *Liopholidophis*"). Polarization of character states as primitive and derived is, in most cases, impossible without reference to an explicit series of outgroups, a hierarchy unavailable with present knowledge of Malagasy colubrids.

General Features of the Skulls of Liopholidophis. Skulls of all species of *Liopholidophis* are lightly built and of rather ordinary colubrid proportions (Figs. 38–40). Prefang maxillary teeth moderate in number in the *sexlineatus* group (17–26; $\bar{x}$ = 20–24) and in *infrasignatus* ($\bar{x}$ = 22); higher in *stumpffi, epistibes,* and *lateralis* (22–31, averaging >25 in each species) (Tables 1–2).

Orbital Region. The frontals and parietal are considerably emarginated in all species, forming a large orbital foramen (Fig. 40); hence, the ventral borders of the frontals and parietal are widely separated below the orbital foramen. In the *stumpffi* group, the ventral and posteroventral edges of the frontals are emarginated to a greater extent than in the *sexlineatus* group. Consequently, in the *stumpffi* group the frontals rest on a high frontal crest of the sphenoid (Fig. 40; see later); the frontals are less emarginated ventrally and the frontal crest of the sphenoid is more poorly developed in the *sexlineatus* group (Fig. 40). Ventral emargination of the frontals similar to that of the *stumpffi* group and associated features such as a high frontal crest on the sphenoid were observed also in *Dromicodryas*, but not in the other Malagasy colubrid skulls examined. The trabecular groove is open along its entire length and is not obscured laterally by an overlapping flange of the frontal.

Basicranial and Posterior Cranial Regions. The Vidian canals are of moderate length (see Myers and Cadle [1994: footnote 9] for notes concerning terminology of Vidian canals). The anterior Vidian foramen is well inside the border of the sphenoid and lies immediately anterior to a bony ridge on the basisphenoid. Detailed morphology of the sphenoid differs between the two species groups, and those differences are described later. Trigeminal foramina double on each side, separated by flange of prootic. A pair of sympathetic foramina on each side ventral to trigeminal foramen.

PHYLOGENETIC RELATIONSHIPS

Monophyly of *Liopholidophis*

There appears to be no unequivocal synapomorphy of *Liopholidophis sensu lato*, which was characterized by Mocquard (1904:303–304) as follows:

> Maxillary teeth in continuous series, about 20 to 25; mandibular teeth subequal, decreasing gradually in length from front to back; head more or less distinct from the neck; eye moderately developed, with round pupil; body cylindrical; tail usually much longer in males than in females; scales smooth, without apical pits, in 17 or 19 longitudinal series; ventrals without lateral keel; anal and subcaudals divided; posterior trunk vertebrae bearing hypapophyses; hemipenis strongly bifurcate.

Mocquard's (1904) erection of *Liopholidophis* resulted from his discovery that these Malagasy colubrids had a deeply bifurcate hemipenis, in contrast to most species of *Tropidonotus*, where these species had been placed by Boulenger (1893). Boulenger (1893, 1915) had maintained the then-recognized species in the large genus *Tropidonotus* Kuhl (section *Amphiesma*; Boulenger, 1893:197), apparently based on their possession of hypapophyses on the posterior trunk vertebrae, but otherwise of rather generalized colubrid morphology (i.e., lacking "derived" features of other hypapophysiate Madagascan genera, such as enlarged anterior mandibular teeth in *Dromicodryas*). Parker (1925) and subsequent authors (Werner, 1929; Guibé, 1954, 1958; Domergue, 1973; Glaw and Vences, 1992, 1994) used Mocquard's concept of *Liopholidophis*.

Indeed, other than the elongate tails of males, which pertains to only a subset of species, *Liopholidophis* has been a repository for generalized, diurnal, smooth-scaled Malagasy colubrids lacking characters such as grooved rear fangs (all Malagasy colubrid genera except *Dromicodryas, Leioheterodon, Liophidium, Liopholidophis,* and *Micropisthodon*), enlarged mandibular teeth (e.g., *Dromicodryas, Micropisthodon, Pseudoxyrhopus*), rostral modifications (e.g., *Leioheterodon*), vertical pupils (e.g., *Madagascarophis*), or mandibular and dental modifications (e.g., *Liophidium*). This situation, in conjunction with external and internal morphological characters differentiating the two species groups (see later), strongly suggests the possibility of paraphyly (or even polyphyly) of *Liopholidophis*. However, there seems little point in altering the composition of the genus until broader relationships among Malagasy colubrids are examined. Until such time, Mocquard's (1904) definition of *Liopholidophis* need only be modified to reflect the fact that the tail is unusually elongate in males of only a section of the genus (*sexlineatus* group) and that these snakes otherwise lack the distinguishing features (? putative synapomorphies) of other Malagasy genera, as just noted. Nevertheless, the uncertain monophyletic status of *Liopholidophis* requires independent treatment of the two species groups (which, as documented later, appear to be monophyletic) in comparative or phylogenetic analyses involving Malagasy colubrids. The content of *Liopholidophis* should be reevaluated as the morphology and relationships of Madagascan colubrids becomes better understood.

Monophyly of the Species Groups of *Liopholidophis*

Parker (1925) recognized two species groups of *Liopholidophis* based on two "key" characters: the *sexlineatus* group characterized by 17 midbody scale rows and the elongate tail of males, including *sexlineatus, dolicocercus,* and *grandidieri,* and the *stumpffi* group characterized by 19 midbody scale rows and the tail in males of "normal" proportions, including *stumpffi* and *lateralis*. Parker (1925) left *L. pinguis,* which has 17 scale rows but "normal" tail proportions (but see later), unplaced as to species group.

I retain Parker's (1925) species groups, but their composition is changed to reflect subsequent new species and revisions (Domergue, 1973, and herein). Furthermore, I consider each a monophyletic clade, notwithstanding lack of supporting evidence for monophyly of *Liopholidophis sensu lato*. Thus, the *sexlineatus* group includes *dolicocercus, grandidieri, pinguis, rhadinaea*, and *sexlineatus*; the *stumpffi* group includes *infrasignatus, lateralis, epistibes*, and *stumpffi*. Species of the two groups are easily distinguished by multiple characters, including tail sexual dimorphism, dorsal scale row number, and skull and hemipenial morphology. The *sexlineatus* group is supported by several apparent synapomorphies, whereas synapomorphies supporting the *stumpffi* group are fewer in number and more equivocal. However, species in the *stumpffi* group are similar to one another in external and (especially) hemipenial morphology. I here document the distinguishing characteristics of these groups and include an amplified discussion of several characteristics (e.g., tail length differences). Hemipenial characters are discussed more fully in the previous section.

Apparently derived characteristics are indicated by "**D**" and the rationale for considering them derived is given. Other characters will not be polarizable until additional Malagasy colubrids are more comprehensively studied. In assessing taxonomic distribution of several characters, I draw on personal observations from a wide variety of colubrids (especially Neotropical). In addition to skulls of *Liopholidophis* (see the Appendix for listing), I examined skulls of the following Malagasy colubrids: *Dromicodryas bernieri* (JEC 12595, 12632), *Geodipsas infralineata* (JEC 11815), *Langaha nasuta* (MCZ 18017), *Leioheterodon modestus* (MCZ 177382), *Liophidium torquatum* (MCZ 11572) and *L. rhodogaster* (JEC 11571), *Lycodryas betsileanus* (JEC 11839), *Mimophis mahfalensis* (MCZ 11715), and *Pseudoxyrhopus tritaeniatus* (JEC 11716) (JEC specimens to be cataloged in the MCZ). A few skull characters were discernible for several species of *Liophidium* from figures or descriptions in Morgan (1973). Numbered characters correspond under the headings for each species group, and present contrasting characteristics for the two groups.

The* sexlineatus *Species Group. All species of the *sexlineatus* group share the following characters:

(1) 17 scale rows at midbody.

(2, **D***) Strong sexual dimorphism in relative tail length (tail length as a percentage of total length).* The difference between means for males versus females ranges from 7% in *pinguis* to 20% in *grandidieri* (1–2% in species of the *stumpffi* group; Fig. 37). Expressed differently, the total ranges of relative tail length in males and females do not overlap in any species of the *sexlineatus* group, whereas, although males tend to have longer tails in species of the *stumpffi* group, the sexes broadly overlap in their ranges of tail proportions (the usual situation in colubrids). When the overlap is expressed as [minimum ♂ value minus maximum ♀ value], the difference ranges from 4 to 29% in the *sexlineatus* group and negative values 1 to 3% in the *stumpffi* group (Fig. 37). Additional sampling of *pinguis* will possibly reveal less distinction between males and females of this species, in which case the extreme sexual dimorphism in tail length would be a synapomorphy of only the section of the *sexlineatus* group including *dolicocercus, grandidieri, rhadinaea*, and *sexlineatus*. A hypothesis for relationships among species put forward below suggests this as a possibility.

As is apparent from Figure 37, the distinctiveness of the tail proportions in the *sexlineatus* group is attributable to the extraordinary lengths of tails in males of *dolicocercus, grandidieri, rhadinaea*, and *sexlineatus*. Females of these species, as well as both sexes of other species of *Liopholidophis*, are rather ordinary in proportional tail length. Ironically, as the tails of males of the *sexlineatus* group are produced to extraordinary lengths, the tails of females (except *grandidieri*) revert to relatively shorter lengths in comparison to those of the *stumpffi* group (Fig. 37).

Comparable data on relative tail length differences for other colubrids are widely scattered, but I am aware of no other species in which the sex differences approach those of the *sexlineatus* group. One compilation for 16 Neotropical colubrids revealed, for two species, maximum differences of 6% between means of proportional tail length for each sex; the modal value for the 16 species was 1% difference (Guyer and Donnelly, 1990:table 3). Two colubrids in that study with tail lengths >40% total length (*Oxybelis aeneus* and *Rhadinaea decorata*) showed typical overlap in ranges of proportional tail length between the sexes (means for each sex were identical in *O. aeneus*; cf. also Myers, 1974: 59, 70, for *R. decorata*). Klauber (1943) reported similarly narrow differences in relative tail lengths between males and females of a wide variety of North American colubrids. Clearly, species of the *Liopholidophis sexlineatus* group are unusual, perhaps unique among colubrids, in this regard.

The sexual dimorphism in tail length and subcaudal number in the *sexlineatus* group is presumably apparent at hatching or birth, but I have seen few specimens of that size, and all those were females, as determined by examination of gonads or for hemipenes. These included three near-hatchlings of *rhadinaea* (MCZ 180387–88, 180398; SVL 122–170 mm) and one of *sexlineatus* (MCZ 180378; SVL 180 mm). The smallest males of *rhadinaea* (MCZ 180396, 180402; SVL 281 and 245 mm, respectively), *sexlineatus* (MCZ 11606; SVL 259 mm), and *dolicocercus* (MZUT 796; SVL 265 mm; data from Peracca, 1892) are either at or toward the lower end of the ranges of proportional tail length for males of those species (Fig. 37). On the other hand, their subcaudal counts are toward the higher ends of the ranges for their respective species. These observations suggest only a weak association between subcaudal count and relative tail length, as well as an increase in relative tail length with growth in these species. Although seemingly counterintuitive, correlations between tail length and subcaudal counts are weak in several species of colubrids (Klauber, 1945; see also Arnold and Bennett, 1988).

One might expect the longer tails of species in the *sexlineatus* group to incur greater frequency of breaks than those of the *stumpffi* group or greater frequency of breakage of the long tails of males in the former group compared to females. Neither expectation holds: species of the *sexlineatus* group do not show greater frequency of tail breakage than those of the *stumpffi* group. Moreover, only in *lateralis*, in which males do not have inordinately long tails, and *sexlineatus*, were most specimens with tail breaks males. Percentages of specimens with healed breaks were as follows (percentage followed by total sample size and proportion of specimens with breaks that were male): *dolicocercus* (0%, 9), *grandidieri* (25%, 4, 0/1), *pinguis* (25%, 12, 0/3), *rhadinaea* (5%, 19, 1/1), *sexlineatus* (10%, 30, 3/3); *infrasignatus* (20%, 32, 1/5), *lateralis* (20%, 44, 7/10), *epistibes* (4%, 24, 0/1), and *stumpffi* (0%, 13).

(3, **D***) Male superiority in body size (SVL) and ventral counts.* With the exception of *dolicocercus*, males of species in the *sexlineatus* group reach greater maximum SVLs than do females (Table 1). The absence of this trend in *dolicocercus* is probably due to the small sample of males (5) of that species, and I predict its occurrence in *dolicocercus* when sufficient samples are available. Males are nearly 40% greater in maximum SVL than females in *rhadinaea* and *sexlineatus*, the two species with reasonable samples of both sexes (Table 1).

Perhaps associated with superior male size in species of the *sexlineatus* group, males of this group (including *dolicocercus*) also have higher ventral counts than females (Table 1). In all species, ranges for ventral counts show virtually no overlap between the sexes, and means for the sexes differ by 8–18 ventrals. As with the statistical correlation between tail length and subcaudal number, Klauber (1945) was unable to demonstrate significant correlation between body length and ventral number.

Female superiority in body size and

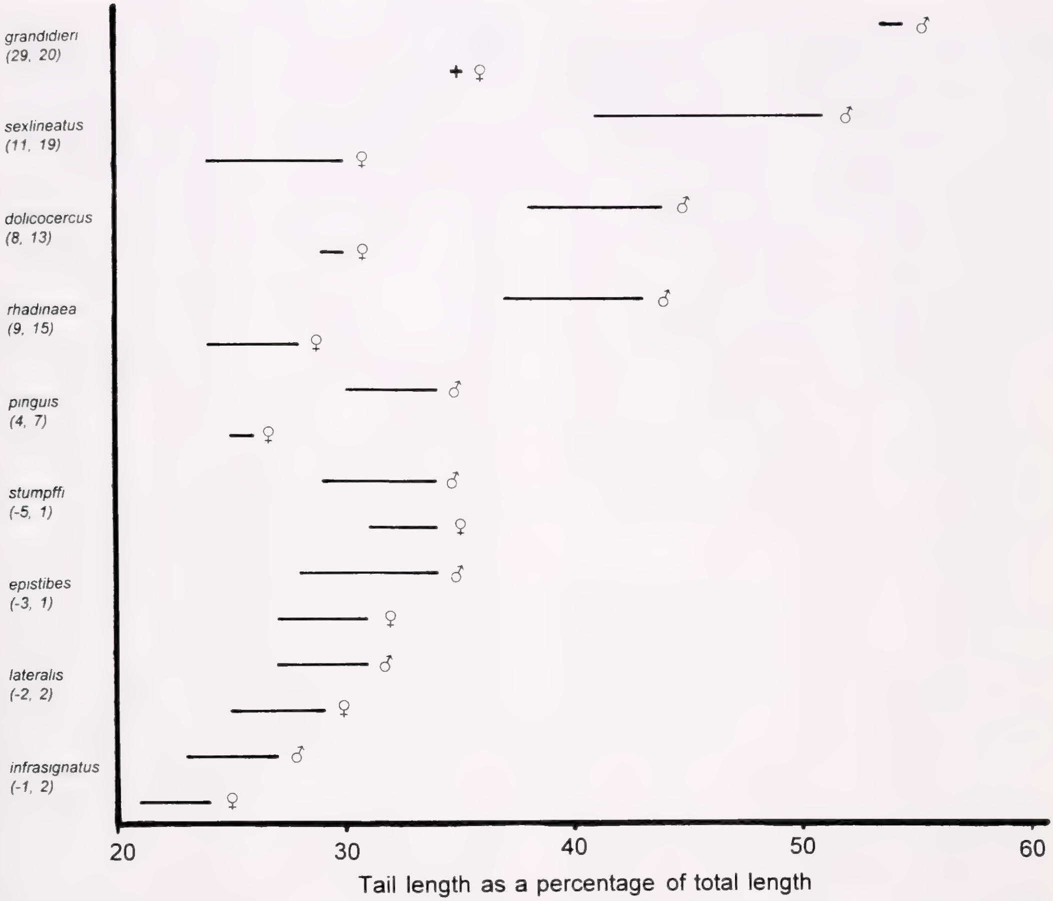


Figure 37. Distribution of tail lengths as a percentage of total lengths in species of *Liopholidophis* (horizontal axis). Bars indicate the total range of percentages for each species, separated by sex. Numbers within parentheses under each species name indicate, respectively, (a) the difference (%) between the minimum male value and maximum female value; and (b) the difference between the mean values for males and females (%).

ventral counts is the rule in the *stumpffi* group (Table 2), as it is in most colubrids (see, e.g., tabulation in Shine, 1991; notable exceptions occur among garter snakes [*Thamnophis*] and their relatives, as discussed by Arnold, 1988, and Arnold and Bennett, 1988). Based on the infrequent occurrence of male size superiority in colubrids, this character is considered a synapomorphy of the *sexlineatus* group. Given the nonsignificant correlation between ventral counts and body size in snakes (Klauber, 1945), the former could perhaps be considered as a separate, corroborating synapomorphy, although conservatively not treated so here.

(4, **D***) Contact or virtual contact between the postorbital and frontal (Fig. 38).* The postorbital nearly contacts the frontal in all species of the *sexlineatus* group; occasionally, the three bones more or less form a three-way junction. Based on examination of a wide variety of other colubrids, this character seems to appear most often in species known or suspected to be at least partly semifossorial or in diminutive leaf-litter snakes. Its occurrence in terrestrial snakes such as species of the

sexlineatus group is considered derived. Among other Malagasy colubrids, this state is observed in *Pseudoxyrhopus tritaeniatus* and species of *Liophidium* (*mayottensis, rhodogaster*, and *vaillanti fide* Morgan, 1973:figs. 25–27; personal observations of *rhodogaster* and *torquatum*), but not in species of *Mimophis, Dromicodryas, Langaha, Leioheterodon, Lycodryas, Geodipsas*, or the *Liopholidophis stumpffi* group (postorbial and frontal widely separated in these snakes).

(5, **D***) Anterior end of the sphenoid narrow, ending in a single point (Fig. 39).*

(6, **D***) Lateral margins of the cultriform process of the sphenoid convergent, forming a narrow isosceles triangle extending forward from the basal part of the bone (Fig. 39).*

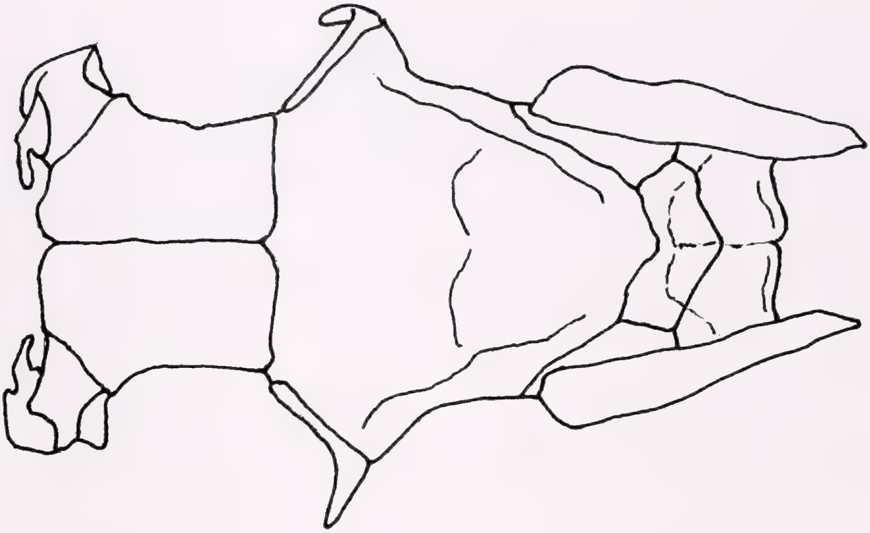
Characters (5) and (6) are uniformly present in species of the *sexlineatus* group, giving the sphenoid of these snakes an unusual form. *Pseudoxyrhopus tritaeniatus* and *Liophidium* spp. also have a triangular sphenoid with a single point anteriorly, but details of shape differ from those of the *sexlineatus* group. (Morgan [1973] reported the sphenoid as "notched" anteriorly in *Liophidium rhodogaster*, but it had a single point in the specimen I examined.) No other Malagasy colubrids examined had a similar configuration. States (5) and (6) in the *sexlineatus* group are similar to those in Neotropical snakes of the tribe Pseudoboini and to burrowing snakes of many clades. However, they are unusual among fully terrestrial colubrids and, consequently, considered apomorphic states of the *sexlineatus* group.

(7) Ventral surface of the sphenoid anterior to the anterior Vidian foramina bears a deep median groove. The anterior median portion of the basisphenoid, more or less between the anterior Vidian foramina, bears a bulbous protuberance. The groove referred to extends forward from this protuberance and is between a pair of parallel bony ridges extending along the cultriform process of the sphenoid. The groove is deepest posteriorly (next to the protuberance); the bony ridges and the groove itself become less prominent anteriorly. Although species of the *stumpffi* group have a similar median protuberance on the sphenoid, no bony ridges or associated groove occur in species of this group; instead, the sphenoid is flat or even slightly convex in this region (a very shallow groove is present in the two skulls of *lateralis* examined but was not bordered by bony ridges). *Pseudoxyrhopus tritaeniatus* and *Geodipsas infralineata* also have a broad groove on the anterior portion of the sphenoid.

(8) Ventral border of frontal usually contacting the dorsal margin of the trabecular grooves for well more than half the length of the ventral edge of the frontal (Fig. 40). This character state is most extreme in *dolicocercus, pinguis*, and *rhadinaea*, in which the entire ventral edges of the frontals parallel the dorsal border of the trabecular grooves; in these species, the sphenoid bears only a slight indication of a frontal step. In *sexlineatus* and *grandidieri*, the posteroventral edge of the frontals is emarginated and supported on a short frontal step of the sphenoid; in these species, the posteroventral border of the frontals forms an angle <30° with the dorsal margin of the trabecular grooves (cf. *stumpffi* group).

(9) Dorsal plate of frontals, viewed as a unit, about as wide at its narrowest point as its length (Fig. 38). Species of the *sexlineatus* group have a more or less squarish shape to the paired frontals, contrasted with the more rectangular shape seen in the *stumpffi* group. Thus, the interorbital portion of the dorsal plate of the frontals is relatively wide (Fig. 38).

(10) Dark stripe occupying at least the lower portion of the first dorsal scale row (usually also occupying the suture line with the ventral scutes and the outer portion of the ventrals). In *rhadinaea*, the stripe is brown and generally restricted to dorsal row 1 (general darkening of the flanks in the "dark" morph extends to outer edges of the ventrals); in the other spe-



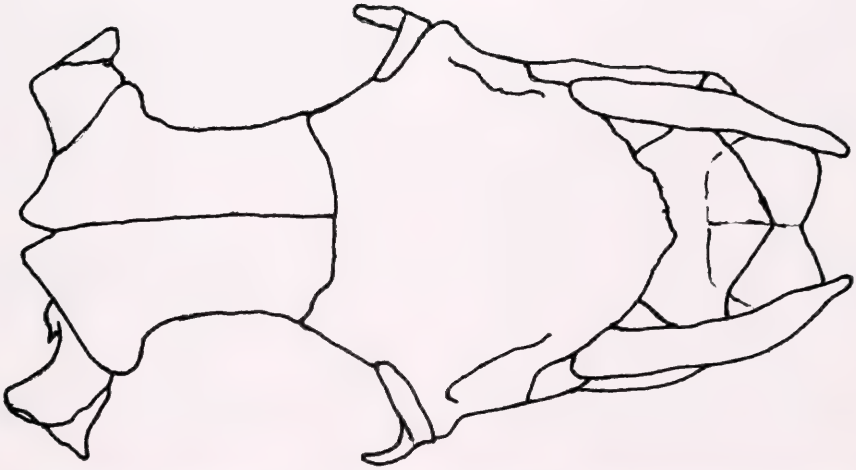


Figure 38. Dorsal views of skulls of *Liopholidophis* showing differences between the *sexlineatus* and *stumpffi* groups (represented by *dolicocercus* and *lateralis*, respectively). Top: *L. dolicocercus* (MCZ 180409). Bottom: *L. lateralis* (MCZ 180350). See text for discussion.

cies, the stripe is black, usually involves the adjacent venter (often substantially so in *sexlineatus*), and sometimes involves other dorsal rows. In *pinguis*, the stripe is indistinct anteriorly, often restricted to the suture line between ventrals and dorsal row 1. The stripe is well developed in *dolicocercus* and *grandidieri*. No such discrete stripe is present in species of the *stumpffi* group, although lateral edges of the ventrals may be spotted or stippled.

(11) Dorsolateral light stripe. Absent in all species of the *sexlineatus* group except *rhadinaea* (universally present in *stumpffi* group). Some specimens of *Liopholidophis sexlineatus* appear to have light dorsolateral stripes (e.g., Glaw and Vences, 1994:pl. 348), but this results from the generally dark middorsum and flanks, rather than from presence of a discrete dorsolateral light stripe.

(12) Apical pits absent. Apical pits are absent in all species of the *sexlineatus* group, whereas they are present in species of the *stumpffi* group.

(13) Passive defense. Species of the *sexlineatus* group normally seem to use no special defenses such as biting or neck/body flattening (see species accounts; cf. *stumpffi* group).

(14) Apical ornamentation of hemipenes various, but never "umbelliform." See hemipenial descriptions and compare *stumpffi* group.

(15) Undivided portion of hemipenis (stalk) well developed. The stalk is approximately 40–50% or more the total length of the hemipenis in the *sexlineatus* group. This state is probably plesiomorphic given its wide distribution in taxonomically diverse colubrids, but equivocally so given the lack of explicit outgroups for these snakes.

(16) Stalk of hemipenis not differentiated into a narrow proximal portion and an expanded midsection that is set off from the proximal portion by a nude shelf and/or delimiting groove. See hemipenial descriptions and compare *stumpffi* group.

The* stumpffi *Species Group. The *stumpffi* species group is characterized by the following characters (additional commentary on some characters in the section immediately preceding; numbered characters in the two sections correspond):

(1) 19 midbody scale rows.

(2) Relative tail length not strongly sexually dimorphic (Fig. 37).

(3) Female superiority in body size (Table 2).

Characters (2) and (3) are the common conditions among colubrids (see, e.g., Klauber, 1943; Guyer and Donnelly, 1990; Shine, 1991).

(4) Postorbital and frontal widely separated by a flange of the parietal (Fig. 38). This is the most common condition observed in a taxonomically and geographically diverse sample of terrestrial colubrids and, with the exception of *Pseudoxyrhopus* and *Liophidium*, the state in all Malagasy colubrids examined. It is therefore probably a plesiomorphic state for the *stumpffi* group.

(5) Anterior end of the sphenoid broad and bifurcate (Fig. 39).

(6) Lateral margins of the cultriform process of the sphenoid parallel or slightly diverging (Fig. 39). States (5) and (6) are uniformly present in species of the *stumpffi* group. The sphenoid, including the form of the cultriform process and of its anterior end, varies greatly in shape among colubrids. Both states are present in a taxonomically and geographically diverse array of colubrids, but both were uncommon states among the Malagasy colubrids examined (state (6) is seen in *Mimophis* and *Dromicodryas*). Given their universal presence in species of the *stumpffi* group, they probably are plesiomorphic within the group, but whether or not they are synapomorphies for the group remains unclear.

(7) Ventral surface of sphenoid anterior to the anterior Vidian foramina flat or convex (no median groove or parallel bony ridges extending forward along the cultriform process from median protuberance). See discussion under *sexlineatus* group.

(8) Ventral and posteroventral edges of frontal emarginate, resting high above the margins of the trabecular grooves on a high frontal crest of the sphenoid (Fig. 40). A consistent feature of species of the *stumpffi* group, the posteroventral margin of the frontal forms an angle >30° with the dorsal margin of the trabecular grooves (cf. *sexlineatus* group). *Liopholidophis la-*

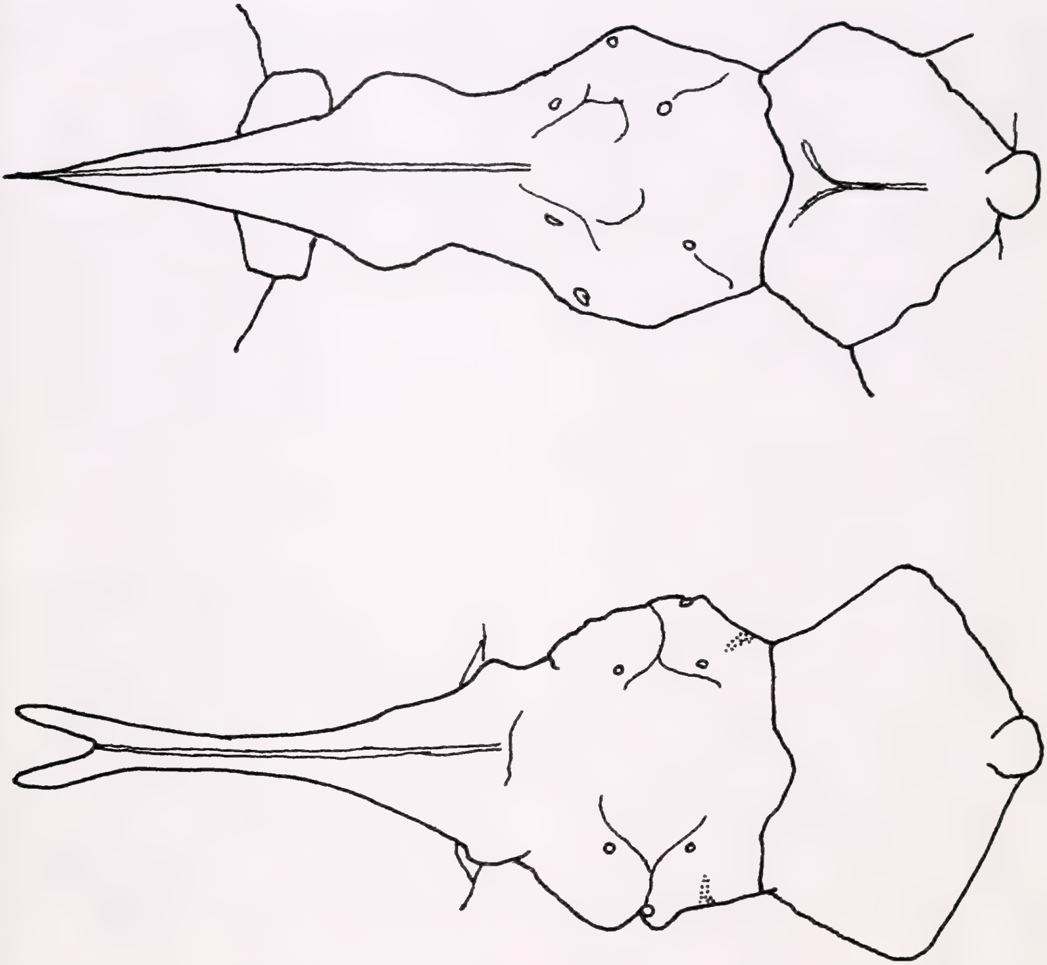


Figure 39. Basicranial region (sphenoid + basioccipital) of *Liopholidophis* showing differences between the *sexlineatus* and *stumpffi* groups (represented by *dolicocercus* and *lateralis*, respectively). Top: *L. dolicocercus* (MCZ 180409). Bottom: *L. lateralis* (MCZ 180350). See text for discussion.

teralis seems to have the least emargination, whereas *epistibes* and *infrasignatus* are more emarginate. This character is widespread taxonomically and geographically within colubrids.

(9) Dorsal plate of frontals, viewed as a unit, longer than the width at its narrowest point (Fig. 38). See discussion under *sexlineatus* group.

(10) No dark stripe on dorsal scale row 1 (cf. sexlineatus *group).*

(11) Dorsolateral light stripe. The light stripe is present on rows 5–7 or 5–6 in *epistibes* and *infrasignatus*, rows 4–5 in *stumpffi*, and rows 3–5 in *lateralis*. A light stripe is present also in *rhadinaea* of the *sexlineatus* group (row 6 anteriorly, 5 posteriorly) but is otherwise absent in that group.

(12) Apical pits present. The number of apical pits appears to be highly variable even within a specimen (0–2 pits present) in the *stumpffi* group. The pits are readily detectable in some specimens; in others, a careful search is required to detect scattered scales with pits. When only a single

pit is present, it is asymmetrically placed to one side of the scale tip. Apical pits appear to be more consistently present and evident in *lateralis* (generally 2 pits) than in other members of the *stumpffi* group.

Scale pits in colubrids vary greatly in their obviousness (see, e.g., Conant, 1961); with the exception of *lateralis* (when they are present in that species), those in the *stumpffi* group are not as easily seen as those of many other colubrids. Nevertheless, all species of the *stumpffi* group have apical pits (none detected in the *sexlineatus* group).

(13, **D***) Presence of dorsoventral neck flattening as a defensive display.* Three species of the *stumpffi* group flatten the neck as a defensive display (no observations for *stumpffi*). In at least *lateralis,* the display can involve a greater portion of the body. In all three species, the behavior highlights the white edges of the dorsal scales and exposes white skin between the scales. This behavior was not observed in any species of the *sexlineatus* group. The extent of white skin between the scales appears to vary within and among species. Often only small patches adjacent to white scale borders are white; in other cases, more extensive patches of skin are involved.

Neck flattening is found in diverse colubrids but seems to be rather taxonomically restricted (Greene, 1988). Myers (1986) used the behavior as a synapomorphy for a Neotropical clade (Xenodontini) comprising six genera. I have not observed the behavior in Malagasy colubrids outside members of the *stumpffi* group and, thus, consider it also as a synapomorphy of the group.

In addition to the use of neck flattening as a defensive display, *epistibes, lateralis,* and *infrasignatus* also bite readily in defense. This contrasts with species of the *sexlineatus* group, which appear to seldom bite in defense (see species accounts).

(14, **D***) Distal tip of hemipenial lobes umbelliform (see hemipenial descriptions and discussion; Figs. 34–36).* Based on its apparently nearly unique occurrence in species of the *stumpffi* group, this character is considered a synapomorphy for the group.

(15) Undivided portion of hemipenis (stalk) reduced. The stalk is especially reduced in *epistibes* and *stumpffi,* which essentially have none.

(16, **D***) Expanded spinose midsection of hemipenis distinctly set off from narrower proximal portion of stalk by a nude shelf and/or delimiting groove.* Because of the unusual and apparently taxonomically restricted nature of this feature, the differentiated midsection of hemipenes in the *stumpffi* group is considered a synapomorphy.

Relationships within the Species Groups

Accepting the monophyly of each of the species groups of *Liopholidophis,* I here briefly explore hypothesized relationships within each group. These hypothesized relationships and supporting evidence are summarized in Figure 41.

Sexlineatus Group. The following is a suggested synapomorphy scheme for species of the *sexlineatus* group and assumes the following plesiomorphic conditions for the group (characters invariant within the group not listed; see "Monophyly of the Species Groups of *Liopholidophis*").

(1) Minimal sexual dimorphism in relative tail length (<10% differences between means for the sexes; cf. Fig. 37). In having the least dimorphic tail length proportions, and in lacking other clearly derived character states, *pinguis* is considered the most plesiomorphic member of the *sexlineatus* group.

(2) Presence of vivid white borders on dorsal scale rows (present in *pinguis, sexlineatus,* and *grandidieri* in the *sexlineatus* group). Minimally involving dorsal row 3, but often other rows as well (see species accounts). Plesiomorphic condition inferred on the basis of presence of this character state in the *stumpffi* group (*stumpffi, epistibes, lateralis,* and *infrasignatus*).

(3) Ventrolateral black stripe on dorsal

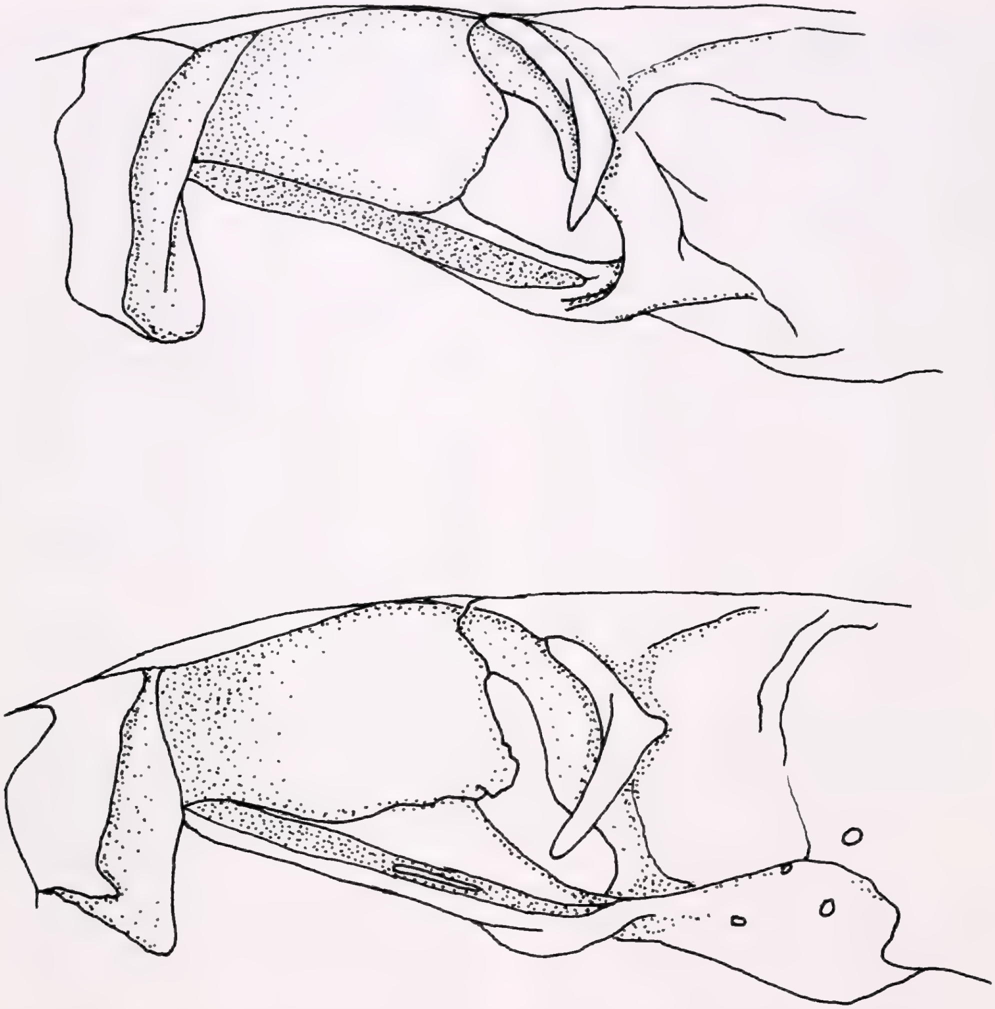


Figure 40. Orbital region of skulls of *Liopholidophis* showing differences between the *sexlineatus* and *stumpffi* groups (represented by *dolicocercus* and *lateralis*, respectively). Top: *L. dolicocercus* (MCZ 180409). Bottom: *L. lateralis* (MCZ 180350). See text for discussion.

row 1 or suture line between ventrals and row 1: well developed posteriorly (weak or absent anteriorly). In all species except *pinguis*, the stripe is well developed anteriorly as well.

(4) Lateral black stripe involving dorsal row 3 (may involve adjacent rows as well): well developed posteriorly. In *pinguis*, the stripe may be well developed (Parker, 1925) or weak (personal observations) anteriorly.

(5) Middorsal pattern uniform the length of the body. The median dorsal scale rows are uniform in ground coloration (i.e., not involving discrete mottling or blotching). Plesiomorphic condition inferred from the condition in the *stumpffi* group.

The diversity of hemipenial structure among species of the *sexlineatus* group and questionable outgroup structure made use of hemipenial characters for comparative purposes here virtually impossible.

The following characters unite clades within the *sexlineatus* group (**D** = derived; cf. Fig. 41; for ease of interpreting Fig. 41, and for distinguishing them from characters in the previous section, these characters are given letter designations):

(*dolicocercus, grandidieri*): (a, **D**) dorsal pattern consisting of complex mottling or reticulations of black and brown anteriorly, black chevrons or blotches posteriorly; (b, **D**) ventral pattern of complete and uniform blackening of ventral scutes (except laterally in *dolicocercus*). Both patterns, but especially the ventral one, are unusual not only in *Liopholidophis,* but among colubrids generally; (c) lateral black stripe anteriorly involving scale rows 3–4 (vestigial anteriorly, and completely absent posteriorly in *dolicocercus*) (In *sexlineatus* and *pinguis,* rows 2–3 are involved, and the stripe is absent in *rhadinaea*).

(*rhadinaea* (*dolicocercus, grandidieri*)): (d, **D**) Loss of vivid white borders to dorsal scale rows. Plesiomorphic condition of presence of white borders, as already inferred. Postulating loss of white borders as a synapomorphy of this clade requires reacquisition in *grandidieri* (i.e., loss then gain). However, based on the distribution of other postulated derived states (Fig. 41) two independent losses would otherwise be required (in *rhadinaea* and *dolicocercus*).

(*sexlineatus* (*rhadinaea* (*dolicocercus, grandidieri*))): (e, **D**) Development of extreme sexual dimorphism in relative tail length (>10% difference between means of relative tail lengths for males and females; see Fig. 37). *Liopholidophis pinguis,* in having the least dimorphic tail proportions, is thereby considered the most plesiomorphic species of the *sexlineatus* group. Nonetheless, the phylogeny hypothesized in Figure 41 suggests that sexual dimorphism in tail length has not progressively increased during the evolution of the *sexlineatus* group: *sexlineatus* and *grandidieri,* the two species with greatest male tail lengths and greatest dimorphism in relative tail length (Fig. 37), are not sister taxa. If the degree of tail dimorphism has had a complex evolutionary history, then hypothesizing that *pinguis* is the sister species to the rest of the *sexlineatus* group on the basis of having the least tail dimorphism may be overly simplistic. However, based on characters examined, *pinguis* seems to share no unequivocally derived features with other species in the group.

***Stumpffi* Group.** I have been less successful postulating relationships among species of the *stumpffi* group. In part this is due to these snakes seemingly being more generalized than those of the *sexlineatus* group, and in part to the mosaic distribution of character states among them (Table 3). Given the questionable monophyly of *Liopholidophis* and lack of explicit outgroups, I have been unable to unambiguously polarize the variable characters (Table 3).

Liopholidophis stumpffi and *epistibes* are superficially more similar to one another (longer tails with more subcaudals, more gracile habitus than *lateralis* and *infrasignatus*) and have an extremely bilobed hemipenis (essentially no basal stalk), which seems to be a more derived morphology than the less bilobed organs of the other two species (f, **D**). Hence, I postulate that *stumpffi* and *epistibes* are sister species on this basis (Fig. 41), but any hypothesis of relationships within this group seems poorly supported with present information.

NOTES ON MNHN 1988-331 (GENUS AND SPECIES INQUIRENDA)

Figure 42

In several instances I alluded to problems concerning the generic limits of both *Liopholidophis* and *Liophidium* (see Discussion under the description of *rhadinaea*; "Monophyly of *Liopholidophis*"). The problem is sharply focused by one specimen with a mosaic of characteristics of both genera. Domergue (1988:143, "Specimen 1") referred MNHN 1988-331 to *Liophidium incertae sedis,* but the specimen is similar to *Liopholidophis rhadi-*

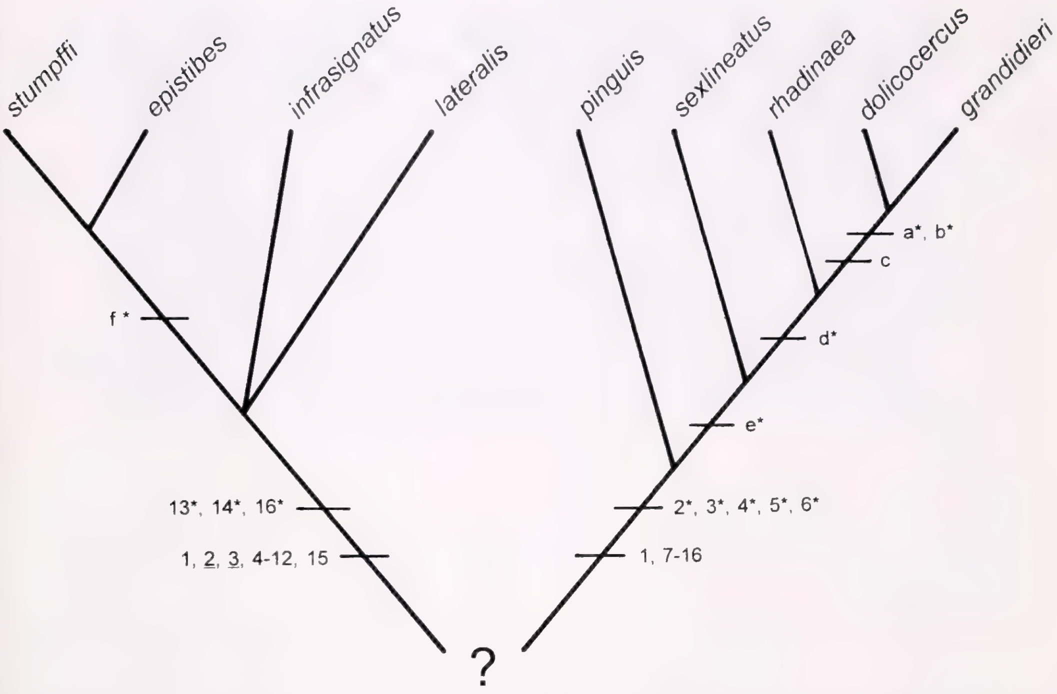


Figure 41. Hypothesized phylogenetic relationships and character summary for species of *Liopholidophis*. As noted in the text, the monophyly of *Liopholidophis sensu lato* is equivocal. Numbered characters discussed in the section "Monophyly of the Species Groups of *Liopholidophis*"; lettered characters discussed under "Relationships within the Species Groups." Asterisked (*) characters are putative derived characters; underlined characters have plesiomorphic states at the levels indicated; characters with neither designation cannot be postulated as either derived or primitive at the level indicated. The numbered characters, which define the two species groups, have alternative states for each group (see text).

naea in overall appearance, although more gracile and with a less distinct head. Comparison of its everted hemipenes with those of *rhadinaea* reveal that the organs are nearly identical! Nevertheless, other characteristics make this specimen particularly enigmatic. (Domergue's [1988] *Liophidium* "Specimen 2" *is* a *Liopholidophis rhadinaea*, which is superficially similar to some species of *Liophidium*.) Hence, I amplify Domergue's treatment of MNHN 1988-331 in order to put the problem of generic limits in a broader perspective.

MNHN 1988-331 (Fig. 42) was collected 10 December 1966 at Perinet [=Andasibe] according to a tag attached to the specimen (Domergue [1988] gave the collection date as 19 December 1966 and the collector as E. R. Brygoo). It is a male, apparently adult, as indicated by mineralized spines on the hemipenes (Domergue [1988] reported the specimen as a juvenile), with hemipenes everted. Total length 313 mm, tail length 92 mm (29% of total), head barely wider than neck; 15–15–15 smooth dorsal scale rows without apical pits; 149 ventrals, divided anal plate, 77 subcaudals; loreal present, 1–1 preoculars, 2–2 postoculars, 1–1 anterior temporals, 1–1 posterior temporals; 8–8 supralabials (4–5 touching eye) and 9–9 infralabials. The specimen has 27 + 2 right maxillary teeth, the fangs ungrooved and about twice the size of the teeth immediately preceding (Domergue states "25–30 maxillary teeth"). Teeth curved, sharp, of normal proportions, and firmly ankylosed to the bone. The articulation between the dentary and

Table 3. Variation in qualitative characteristics among species of the *Liopholidophis stumpffi* group.

	stumpffi	*epistibes*	*lateralis*	*infrasignatus*
Relatively long tail (high subcaudal counts)	yes	yes	yes (males)	no
Dorsolateral stripe	rows 4–5	rows 5–6 or 5–7 (4–5 posteriorly)	rows 3–4–5 (occasionally 4 only)	rows 5–6
Light stripe confluent with light throat	yes	no	yes	no
Stripe complete the length of body and tail	Body: sometimes Tail: sometimes	Body: sometimes Tail: sometimes	Body: yes Tail: yes	Body: rarely Tail: no
Venter[1]	more or less immaculate	usually heavily pigmented	immaculate	usually heavily pigmented
Ventral counts relatively low (mean $<$ca. 150)	yes	no (>160 both sexes)	no (155, males; 160, females)	yes
Maxillary teeth (mean)	>25	>25	>25	<25
Enlarged spines encircling base of hemipenial lobes	single row; few	multiple rows; many	sparse, spines clustered; few	multiple rows; many
Hemipenial stalk	very short	very short	long	intermediate
Sulcus spermaticus[2]	forked $\geq 75\%$ its length	forked $\geq 75\%$ its length	forked ca. 60% its length	forked ca. 70% its length

[1] All species of the *stumpffi* group may have encroachment of dorsal pigment and/or dark dots at lateral edges of ventrals. This comparison refers to additional ventral pigmentation.

[2] The length of the basal unforked portion of the sulcus spermaticus is correlated with the length of the hemipenial stalk, so these two characters may not be independent. However, nothing would seem to preclude a snake having a long hemipenial stalk from having the sulcus divide basally and, thus, having a short unforked portion of the sulcus.

the compound bone of the lower jaw appears to be about half way along the length of the dentary. The presence of hypapophyses on posterior trunk vertebrae was not verified.

Coloration in Life (Domergue, 1988: 144, Paraphrased). "Dorsum reddish brown; the head equally reddish brown (but darker than the body) and having three light yellow spots; the upper labials white, spotted with brown; venter red except for the throat, which is white."

Coloration and Pattern in Preservative. General dorsal coloration medium brown to yellowish brown. Dorsolateral light stripe on lower portion of dorsal row 5, bordered above and below by a slightly darkened series of dashes; the light stripe continuous from neck to near the end of the tail and tending to be a series of dashes on the tail. Rows 1–3 light brown; the 3 middorsal rows slightly darker brown than adjacent 1½ rows, which border the dorsolateral light stripe. Three small light nape spots, each surounded by a dark brown line. Top of head brown; head cap separated from white supralabials by a thin dark brown streak along dorsal border of supralabials. A few scattered brown spots on posterior supralabials. Venter and subcaudals, including throat, gular region, and infralabials, immaculate whitish. No dark pigment at edges of ventrals, or on scale row 1 except posteriorly, where a series of small brown spots is present; the latter continues onto the tail to become a continuous line at the lateral edges of the subcaudals.

Hemipenis. Both hemipenes of MNHN 1988-331 were everted upon preservation, the left one completely, the right organ with the tips of the lobes remaining inverted. The left organ has a total length

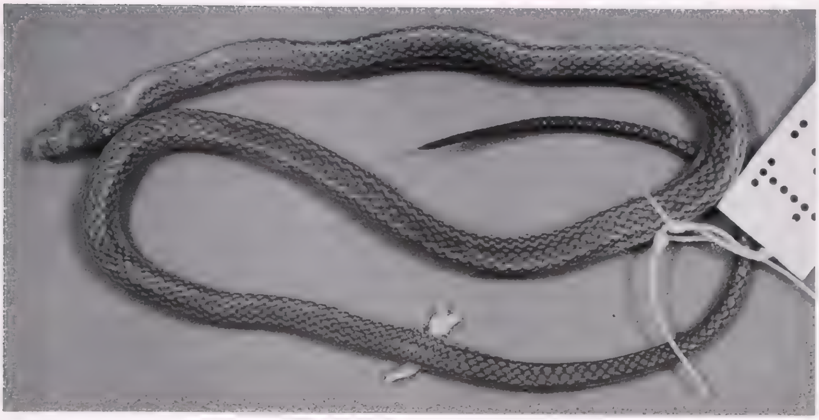


Figure 42. MNHN 1988-331, genus and species *inquirenda*. Approximately ×1.2.

of approximately 5 mm, the length of the lobes approximately 2 mm. The sulcus spermaticus divides about 2.5 mm from the base of the organ. The organ is deeply bilobed, noncapitate, acalyculate (entirely spinose), with small nude areas at the tips of the lobes, and a deeply bifurcate centrolineal sulcus spermaticus. No basal pockets or lobes.

The sulcus spermaticus is a deep groove, bifurcate for half its length, the branches terminating on the same side of the organ at the tips of the lobes (centrolineal in orientation). The tips of the branches of the sulcus on the left organ are difficult to discern, as if they simply peter out rather than having a discrete endpoint (distal tips narrow and very shallow; proper lighting necessary to see the ends).

The stalk (about 40% the length of the organ) is covered on all sides with small hooked spines. The stalk abruptly broadens below the sulcus division, the spines coincidently increasing in size (spines here about twice as large as those on the base of the stalk). The lobes, including the crotch and inner and outer surfaces, are covered with hooked spines except for the distal nude tips of the lobes. The spines are arrayed more or less in longitudinal rows.

The tips of the lobes are nude but not appearing as cylindrical or as discrete as the awns on the hemipenis of *Liopholidophis rhadinaea*.

Discussion. Domergue (1988) did not give reasons for referring MNHN 1988-331 to *Liophidium*. Other than head proportions (head small and little distinct from neck), the specimen shares few features with other species of *Liophidium*. The dentition (sharp, curved teeth; enlarged rear maxillary teeth) and a "normal" articulation between the dentary and compound bone of the lower jaw (see Discussion under *Liopholidophis rhadinaea*) seem to preclude association of MNHN 1988-331 with *Liophidium* as usually defined (Boulenger, 1896; cf. also Savitzky, 1983; rear maxillary teeth in some *Liophidium* are somewhat enlarged, but not to the extent seen in MNHN 1988-331 in specimens I examined). Other features, such as the lack of scale row reductions, 15 dorsal rows, labial formulae, and relative tail length, are variable among the nominal taxa presently in *Liophidium* (approximately 8 species in Madagascar and the Comoro Islands; Domergue, 1983, and personal observations). An unusual feature of MNHN 1988-331 appears to be the presence of a single posterior temporal (2 in other species of *Liophidium*; Guibé, 1958, and personal observations).

The most puzzling aspects of MNHN 1988-331 are the striking similarities to *Liopholidophis rhadinaea* in color pattern, dentition, and hemipenis, but notable differences in most other aspects of scalation and body proportions. These similarities include (1) darkened middorsal 3 scale rows, although not so darkened in MNHN 1988-331 as in *rhadinaea*; (2) dorsolateral light brown stripe (row 5 in MNHN 1988-331 vs. centered on row 6 in *rhadinaea*); (3) three light nape spots surrounded by narrow dark brown line (smaller in MNHN 1988-331 than in *rhadinaea*); (4) top of head plain brown and unpatterned; (5) dark brown line at upper edge of supralabials separating head cap from white supralabials (line not so dark or broad in MNHN 1988-331 as in *rhadinaea*); (6) immaculate venter, red in life *fide* Domergue (1988) (pink to vermilion in *rhadinaea*); (7) dentition similar in overall appearance, and maxillary tooth number for MNHN 1988-331 within the range of variation seen in *rhadinaea*; and (8) overall similarity in hemipenial morphology.

The hemipenes of *Liopholidophis rhadinaea* and MNHN 1988-331 are similar in form, differing mainly in two features: (1) the cylindrical awns at the tips of the lobes in *rhadinaea* are discrete structures, somewhat set off from the body of the lobes (Fig. 30), whereas the nude tips of the lobes in MNHN 1988-331 are not so discretely set off; and (2) the sulcus spermaticus in *rhadinaea* terminates at the base of the awns with a discrete endpoint, whereas the branches of the sulcus in MNHN 1988-331 appear to extend to the tips of the lobes, where they peter out rather than having a discrete endpoint. The organ of *rhadinaea* may have a somewhat more dense array of spines on the lobes than MNHN 1988-331, but the difference is subtle. Although the hemipenis of MNHN 1988-331 differs in these ways from that of *rhadinaea*, the organs of the two are exceedingly similar for snakes that otherwise differ in many ways (more similar, for example, than the hemipenis of *rhadinaea* is to any other species of *Liopholidophis*).

In addition to having unreduced 15 dorsal scale rows, scale counts and tail proportions of MNHN 1988-331 are well outside the ranges for males of *Liopholidophis rhadinaea* (cf. Table 1): ventrals 149 (vs. 170–179), subcaudals 77 (vs. 126–137), and tail relative to total length 29% (vs. 37–43%).

Its peculiar mosaic suite of characteristics do not allow unambiguous allocation of MNHN 1988-331 to any Malagasy colubrid genus as currently defined. That, along with questions already raised concerning the proper definition of *Liophidium* vis-à-vis similarities between *Liopholidophis rhadinaea* and *Liophidium*, differences among species of *Liophidium* (see Discussion after description of *L. rhadinaea*), and the questionable monophyly of *Liopholidophis*, suggest that future work may result in reallocation of some nominal taxa with improved understanding of phylogenetic relationships among Malagasy colubrids. The question with respect to *Liophidium* is the extent of interspecific variation in the "unique" dentitional and other skull characteristics attributed to that genus (Boulenger, 1896: 598–599; Savitzky, 1981, 1983), particularly in the new species recently described (Domergue, 1983). Such investigation remains to be done.

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APPENDIX: SPECIMENS EXAMINED

The following abbreviations of collections are used in the text and in the list of specimens examined. As all specimens are from Madagascar, localities begin with the province. Coordinates are given for those localities that could be reliably localized. However, because Malagasy place names are highly redundant, coordinates were not readily apparent for some older specimens examined for which no provinces were given. Bracketed information in localities are inferred political units (province and, where possible, fivondronana), coordinates, or updated names for towns. Parenthetical expressions within localities are part of the original locality data. A useful reference for names of smaller political units within provinces (fivondronanas) is Brygoo (1971:map 4, p. 36), although some must now be updated to reflect current name usage. Some localities are annotated with collector or other historical information that help localize older sites. Skeletal preparations examined are indicated as *sk* (skull) or *skel* (complete skeleton, including skull). Specimens of *rhadinaea* and *epistibes* are listed in the descriptions of those species.

AMNH	American Museum of Natural History, reptile collection, New York
BMNH	British Museum (Natural History), London
FMNH	Field Museum of Natural History, Chicago
MCZ	Museum of Comparative Zoology, reptile collection, Harvard University, Cambridge
MNHN	Museum National d'Histoire Naturelle, Paris
MZUT	Museo Zoologica dell'Università di Torino [now incorporated as part of the Museo Regionale di Scienze Naturali di Torino], Torino
SMF	Natur-Museum und Forschungsinstitut Senckenberg, Frankfurt
USNM	National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Liopholidophis dolicocercus (Peracca)

FIANARANTSOA: *Fivondronana Ifanadiana:* Talatakely, Ranomafana National Park, 970–1,050 m [21°16′S, 47°25′E], MCZ

180403–08. Mountain ridge N Miaranony, approximately 9.8 km WNW (airline) Tsaratanana, Faravory River, Ranomafana National Park, 800 m [21°09′30″S, 47°33′E], MCZ 180409 (*skel*). ***[TOAMASINA:** Fivondronana Moramanga]:* "Valle dell'Umbi (Andrangoloka)" [Valley of the Umbi River (Andrangoloka)] [=Andrangoloaka] [19°02′S, 47°55′E], MZUT 0796 (holotype; color slides only seen). Moramanga, eastern Madagascar [18°56′S, 48°12′E], SMF 17575 (=7246.1a, as listed by Boettger, 1898:25, 1913:312).

Liopholidophis grandidieri Mocquard

[FIANARANTSOA:** Fivondronana Ambositra]:* Ambohimitombo Forest, Madagascar [20°43′S, 47°26′E], BMNH 95.7.4.32 (specimen b of Boulenger, 1896:607 [as *Tropidonotus dolicocercus*]). *Fivondronana Ifanadiana:* Mt. Maharira, Ranomafana National Park, approximately 1,375 m [21°19′59″S, 47°24′57″E], MCZ 180297 (*sk*). ***[? TOAMASINA]: Eastern Imerina, BMNH 95.10.29.52 (specimen a of Boulenger, 1893:247 [as *Tropidonotus dolicocercus*]; see remarks under "Distribution" in species account for this locality). ***[TOLIARA:** Fivondronana Toliara]:* L'embouchure du Saint-Augustin ["mouth of the Saint-Augustin River," here considered to be in error] [23°33′S, 43°46′E], MNHN 02-103 (holotype) [the Saint-Augustin River is now referred to as the Onilahy River, and the town of Saint-Augustin at its mouth as Ianantsony or Anantsony].

Liopholidophis infrasignatus (Günther)

NO SPECIFIC LOCALITIES: "Imerina," BMNH 95.10.29.53–55 (specimens k–m of Boulenger [1893:248], as [*Liopholidophis*] *stumpffii*; see remarks under "Distribution" in *grandidieri* species account for this locality). ***[FIANARANTSOA:** Fivondronana Ambohimahasoa]:* Arkafana, eastern Betsileo [=Ankafana *fide* Boulenger, 1893:247; 21°12′S, 47°12′E; 1,600 m *fide* Carleton and Schmidt, 1990; see "Remarks" in account for *infrasignatus*], BMNH 1946.1.7.57 (lectotype, herein designated); BMNH 1946.1.7.56, 1946.1.7.58 (paralectotypes). *[Fivondronana Ambositra]:* Ivohimanita [approximately 20°50′S, 47°30′E], BMNH 96.10.9.16–17 [specimens collected by Major, who, discussing the locality as "Ivohimanitra" (Major, 1896), gave the elevation as 1,000–1,100 m; MacPhee (1987) gives 700 m, whereas Carleton and Schmidt (1990) give 900 m]. *Fivondronana Ifanadiana:* Talatakely, Ranomafana National Park, 970 m [21°16′S, 47°25′E], MCZ 180354–70 (180357, *skel*; 180370, *sk*). Ivalohoaka, Ranomafana National Park, approximately 1,040 m [21°17′50″S, 47°26′20″E], MCZ 180371. Mountain ridge N Miaranony, approximately 9.8 km WNW (airline) Tsaratanana, Faravory River, Ranomafana National Park, 850 m [21°09′30″S, 47°33′E), MCZ 180373. Approximately 2.2 km (airline) SE Sahavondrona along Andranoroa River, 1,170 m [21°17′10″S, 47°21′20″E], MCZ 180372. *Fivondronana Midongy du Sud:* Approximately 7 km SW (airline) Midongy du Sud [=Midongy Atsimo], near Rianambo ("high waterfall") on Alapo River, 670 m [23°35′S, 47°01′E], MCZ 180374. ***[TOAMASINA:** Fivondronana Moramanga]:* Moramanga [18°56′S, 48°12′E], SMF 17578. Perinet forestry station, 900 m [=Andasibe; 18°56′S, 48°25′E], MNHN 1971-332 (holotype of *Liopholidophis thieli* Domergue). 8 km E Perinet [=Andasibe; 18°56′S, 48°25′E], USNM 149895.

Liopholidophis lateralis (Duméril, Bibron, and Duméril)

NO SPECIFIC LOCALITIES: "Madagascar," BMNH 71.6.28.17, 1946.1.15.19 (syntypes of *Dromicus madagascariensis* Günther). ***[ANTANANARIVO:** Fivondronana Manjakatompo]:* Monjakatompo [=Manjakatompo], 10 km W Ambatolompy [=Ambatolampy] [19°20′S, 47°26′E; 1940 m *fide* Angel, 1934], AMNH 60675–76, 60679–80 (60676, *sk*). ***FIANARANTSOA:***

[Fivondronana Fianarantsoa]: Fianarantsoa [21°26'S, 47°05'E], SMF 57037. *Fivondronana Ifanadiana:* 1–2 km W Ranomafana (by trail on S side of Namorona River), approximately 700 m [21°15'S, 47°27'E], MCZ 180344–45. Trail between Tsaratanana and Ambohipo, approximately 400–500 m [21°11'S, 47°37'E], MCZ 180346–52 (180350, *skel*). Talatakely, Ranomafana National Park, 970 m [21°16'S, 47°25'E], MCZ 180353. *Fivondronana Midongy du Sud:* Approximately 4 km SW (airline) Midongy du Sud [=Midongy Atsimo], approximately 600 m [23°35'S, 47°01'E], MCZ 180380. Approximately 7 km SW (airline) Midongy du Sud [=Midongy Atsimo], near Rianambo ("high waterfall") on Alapo River, 670 m [23°35'S, 47°01'E], MCZ 180375. ***[MAHAJANGA:*** *Fivondronana Mahajanga]:* Majunga [=Mahajanga; 15°43'S, 46°19'E], SMF 17586, 57163. ***[TOAMASINA:*** *Fivondronana Toamasina]:* Tampina [18°30'S, 49°16'E; part of Bluntschili collection; see Mertens, 1933], AMNH 71498. 85 km N Mormunga [? = Moramanga; ?18°56'S, 48°12'E], USNM 149243. ***[TOLIARA:*** *Fivondronana Tolagnaro]:* Eminiminy [approximately 24°40'S, 46°55'E], AMNH 71506 [part of Bluntschili collection; in the Ambolo (=Manampanihy) Valley and 400 m elevation *fide* Mertens, 1933:261]. *Fivondronana Betroka:* Betroka [23°16'S, 46°05'E], USNM 149374–75. *[? Fivondronana Moramanga]:* "Eastern forest" [about half way between Tamatave (=Toamasina) and Tananarive (=Antananarivo)], MCZ 11659–68, 11670–73, 11675–81 (see "Remarks" in *pinguis* species account for discussion of locality).

Liopholidophis pinguis
Parker

NO SPECIFIC LOCALITIES: "Nord-Madagascar," SMF 61909. "Madagascar," AMNH 60692. ***[TOAMASINA:*** *Fivondronana Ambatondrazaka]:* Lake Alaotra [17°30'S, 48°30'E], BMNH 1936.3.3.94–97. *[Fivondronana Moramanga]:* Perinet [=Andasibe; 18°56'S, 48°25'E], USNM 149242. *[? Fivondronana Moramanga]:* "Eastern forest" [about half way between Tamatave and Tananarive], MCZ 11698–11701 (11701, *sk*) (see "Remarks" in *pinguis* species account for discussion of locality).

Liopholidophis sexlineatus
(Günther)

NO SPECIFIC LOCALITIES: "Eastern Betsileo," BMNH 1946.1.13.17–19 (old numbers 82.5.8.2–4) (syntypes of *Dromicus sexlineatus* Günther); BMNH 1946.1.13.28–30 (old number 82.2.25) (syntypes of *Dromicus macrocercus* Günther). See "Remarks" in species account for locality comments. ***INDETERMINATE LOCALITY:*** Mangerano, SMF 57028, collected by K. L. Koch (probably = Mangarano; the Defense Mapping Agency [1989] lists 12 localities with this name; the SMF has specimens collected by Koch from widely scattered localities in Madagascar, so the particular locality represented by SMF 57028 is unclear). ***ANTANANARIVO:*** *Fivondronana Manjakatompo:* Monjakatompo [=Manjakatompo], 10 km W Ambatolompy [=Ambatolampy] [19°20'S, 47°26'E; 1940 m *fide* Angel, 1934], AMNH 60678 (*sk*). ***FIANARANTSOA:*** *Fivondronana Ifanadiana:* Ambatolahy, approximately 2.3 km NW (airline) Ranomafana, approximately 850 m [21°14'55"S, 47°25'48"E], MCZ 180325–35 (180332, *skel*). Approximately 2.2 km (airline) SE Sahavondrona along Andranoroa River, 1,170 m [21°17'10"S, 47°21'20"E], MCZ 180336–37. Ambodirafia [21°19'S, 47°35'E], MCZ 180338. *Fivondronana Midongy du Sud:* Approximately 7 km SW (airline) Midongy du Sud [Midongy Atsimo], near Rianambo ("high waterfall") on Alapo River, 670 m [23°35'S, 47°01'E], MCZ 180376–79. ***[TOAMASINA]:*** Eastern forest [about half way] between Tamatave (=Toamasina) and Tananarive (=Antananarivo)], MCZ 11602–06 (see comment on this locality in species account remarks for *L. pinguis*).

Liopholidophis stumpffi (Boettger)

[ANTSIRANANA: Fivondronana Antsiranana]: Route from Antsohihy NW to Diego Suarez, NE Madagascar [approximately 12°20′S, 49°05′E], MCZ 54368. Montagne d'Ambre [=Ambohitra; 12°30′S, 49°10′E], MNHN 1893.211 (syntype of *Liophidium gracile* Mocquard), USNM 150595. *[Fivondronana Nosy Be]:* Nossi-Bé [=Nosy Be; 13°20′S, 48°15′E], SMF 17576 (lectotype, herein designated), 17577, 17580–84; FMNH 18291; BMNH 1946.1.23.51; MNHN 84-595 (syntype of *Liophidium gracile* Mocquard).

LITERATURE CITED

Ahl, E. 1928. Neue Frösche der Gattung *Rhacophorus* aus Madagaskar. Zoologischer Anzeiger, **75**(11/12): 311–318.

Angel, F. 1934. Sur une collection de reptiles et de batraciens de Madagascar. Faune des Colonies Français **5**(6): 311–320.

———. 1936. Matériaux herpétologiques recueillis à Madagascar par M. Roger Heim, Chargé de Mission: description de deux formes nouvelles. Bulletin du Muséum National d'Histoire Naturelle, Paris, ser. 2, **8:** 125–129.

Arnold, S. J. 1988. Quantitative genetics and selection in natural populations: microevolution of vertebral numbers in the garter snake *Thamnophis elegans*, pp. 619–636. *In* B. S. Weir, E. J. Eisen, M. J. Goodman, and G. Namkoong (eds.), Proceedings of the Second International Conference on Quantitative Genetics. Sunderland, Massachusetts: Sinauer Associates.

Arnold, S. J., and A. F. Bennett. 1988. Behavioural variation in natural populations. V. Morphological correlates of locomotion in the garter snake (*Thamnophis radix*). Biological Journal of the Linnaean Society, **34:** 175–190.

Barbour, T. 1918. Vertebrata from Madagascar. 2. Amphibia and Reptilia. Bulletin of the Museum of Comparative Zoology, **61:** 479–489.

Bastard, E. J. 1898. Quelques mots sur une mission à Madagascar. Bulletin du Muséum d'Histoire Naturelle, Paris, **4:** 248–251.

Blackburn, D. G. 1993. Standardized criteria for the recognition of reproductive modes in squamate reptiles. Herpetologica, **49**(1): 118–132.

———. 1994. Review: discrepant usage of the term 'ovoviviparity' in the herpetological literature. Herpetological Journal, **4:** 65–72.

Blommers-Schlösser, R. M. A., and C. P. Blanc. 1991. Faune de Madagascar 75 (1): Amphibiens (première partie). Paris: Muséum National d'Histoire Naturelle. 379 pp.

Boettger, O. "1879" [1877]. Die Reptilien und Amphibien von Madagascar. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, **11:** 1–56.

———. 1881a. Diagnoses reptilium et batrachiorum novorum ab ill. Antonio Stumpff in insula Nossi-Be Madagascariensi lectorum. Zoologischer Anzeiger, **4**(87): 358–362.

———. 1881b. Die Reptilien und Amphibien von Madagascar. Dritter Nachtrag. I. Studien über Reptilien und Amphibien von Madagascar. II. Aufzählung der bis jetzt von Madagascar und seinen Küsteninseln bekannt gewordenen Reptilien und Amphibien. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft, **12:** 435–558.

———. 1898. Katalog der Reptilien-Sammlung im Museum der Senckenbergischen Naturforschenden Gesellschaft in Frankfurt am Main. II (Schlangen). Frankfurt am Main: Druck von Gebrüder Knauer. 160 pp.

———. 1913. Reptilien und Amphibien von Madagascar, den inseln und dem festland Ostafrikas (Sammlung Voelzkow 1889–1895 und 1903–1905), pp. 269–375 [+pls. 23–30]. *In* A. Voeltzkow (ed.), Reise in Ostafrika in den Jahren 1903–1905 (Wissenschaftliche Ergebnisse. Band III. Systematische Arbeiten. Heft IV). Stuttgart: E. Schweizerbart'sche Verlagsbuchhandlung, Nägele & Dr. Sproesser.

Boulenger, G. A. 1888. Descriptions of new reptiles and batrachians from Madagascar. Annals and Magazine of Natural History, 1, ser. **6:** 101–107.

———. 1893. Catalogue of the Snakes in the British Museum (Natural History), Vol. I. London: British Museum (Natural History). 448 pp.

———. 1896. Catalogue of the Snakes in the British Museum (Natural History), Vol. III. London: British Museum (Natural History). 727 pp.

———. 1915. A list of snakes of Madagascar, Comoro, Mascarenes and Seychelles. Proceedings of the Zoological Society of London, **1915:** 369–382.

Brygoo, E. R. 1971. Reptiles: Sauriens: Chamaeleonidae: genre *Chamaeleo*. Faune de Madagascar, **33:** 1–318.

———. 1983. Les ophidiens de Madagascar. Memorias do Instituto Butantan, **46**(1982): 19–58.

———. 1987. L'Endemisme des reptiles de Madagascar. Bulletin de la Société Zoologique de France, **112:** 5–38.

Cadle, J. E. 1995. A new species of *Boophis* (Anura: Rhacophoridae) with unusual skin glands from Madagascar, and a discussion of variation and sexual dimorphism in *Boophis albilabris* (Boulenger). Zoological Journal of the Linnean Society, **115**, in press.

Carleton, M. D., and D. F. Schmidt. 1990. Systematic studies of Madagascar's endemic rodents

(Muroidea: Nesomyinae): an annotated gazetteer of collecting localities of known forms. American Museum Novitates, **2987:** 1–36.

CONANT, R. 1961. A new water snake from Mexico, with notes on anal plates and apical pits in *Natrix* and *Thamnophis*. American Museum Novitates, **2060:** 1–22.

COWAN, W. D. 1883. Notes on the natural history of Madagascar. Proceedings of the Royal Physical Society of Edinburgh, **7:** 133–150.

DEFENSE MAPPING AGENCY. 1989. Gazetteer of Madagascar, 2nd edition. Washington, D.C.: Defense Mapping Agency. xvii + 826 pp.

DOMERGUE, C. A. 1962. Observations sur les pénis des Ophidiens (deuxième note). Bulletin de la Société des Sciences Naturelles et Physiques du Maroc, **42**(1–2): 87–105.

———. "1973" [1972]. Etude de trois serpents malgaches: *Liopholidophis lateralis* (D. & B.), *L. stumpfii* (Boettger) et *L. thieli* n. sp. Bulletin du Muséum National d'Histoire Naturelle, Paris, 3e ser., no. 103, Zool. **77:** 1397–1412.

———. 1983. Notes sur les serpents de la region malgache. III. Description de trois espèces nouvelles rapportèes au genre *Liophidium* Boulenger, 1896. Bulletin du Muséum National d'Histoire Naturelle, Paris, ser 4, **5**(sect. A, no. 4): 1109–1122.

———. 1988. Notes sur les Serpents de la region Malgache VIII. Colubridae nouveaux. Bulletin du Muséum National d'Histoire Naturelle, Paris, 4 ser., **10**(sect. A, no. 1): 135–146.

DOWLING, H. G. 1959. Apical papillae on the hemipenes of two colubrid snakes. American Museum Novitates, **1948:** 1–7.

DOWLING, H. G., AND J. M. SAVAGE. 1960. A guide to the snake hemipenis: a survey of basic structure and systematic characteristics. Zoologica, **45:** 17–31.

DUMÉRIL, A. M. C., G. BIBRON, AND A. DUMÉRIL. 1854. Erpétologie Générale, Vol. 7. Paris: Muséum National d'Histoire Naturelle. Première Partie, vii + 4 + xvi + 780 pp; Deuxième Partie, xii + 780–1536 pp.

ELTER, O. 1981. Cataloghi V.—La Collezione Erpetologica del Museo di Zoologia dell'Università di Torino. Torino: Museo Regionale di Scienze Naturali, Torino. 116 pp.

FISCHER, J. G. 1884. Über einige afrikanische Reptilien, Amphibien und Fische des Naturhistorischen Museums. II. Über einige Reptilien von Nossi-Bé und Madagaskar. Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten, **1:** 33–38.

GALLIENI, J. S. 1908. Neuf ans à Madagascar. Paris: Librairie Hachette et Cie. xv + 372 pp.

GLAW, F., AND M. VENCES. 1992. A Fieldguide to the Amphibians and Reptiles of Madagascar. Köln, Germany: Privately Published. 331 pp.

———. 1994. A Fieldguide to the Amphibians and Reptiles of Madagascar, 2nd edition. Köln, Germany: Privately Published. 480 pp.

GRANDIDIER, A. 1893. Les voyageurs français à Madagascar pendant les trente dernières années. Bulletin de la Societé de Géographie de Paris, ser. 7, **14:** 289–300.

GREENE, H. W. 1988. Antipredator mechanisms in reptiles, pp. 1–152. *In* C. Gans and R. B. Huey (eds.), Biology of the Reptilia, Vol. 16, Ecology B: Defense and Life History. New York: Alan R. Liss.

GUIBÉ, J. 1954. Etude de *Liopholidophis lateralis* (D. et B.) et description d'une espèce nouvelle [Reptiles]. Memoires de Institut Scientifique de Madagascar, ser. A, **9:** 241–246.

———. 1958. Les serpents de Madagascar. Memoires de Institut Scientifique de Madagascar, ser. A, **12:** 189–260.

GÜNTHER, A. 1872. Seventh account of new species of snakes in the collection of the British Museum. Annals and Magazine of Natural History, 9, ser. **4**(49): 13–37.

———. 1882. Ninth contribution to the knowledge of the fauna of Madagascar. Annals and Magazine of Natural History, **9:** 262–266.

———. 1890. Tenth contribution to the knowledge of the fauna of Madagascar. Annals and Magazine of Natural History, 5, ser. **6:** 69–72.

GUYER, C., AND M. A. DONNELLY. 1990. Length–mass relationships among an assemblage of tropical snakes in Costa Rica. Journal of Tropical Ecology, **6:** 65–76.

INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE. 1985. International Code of Zoological Nomenclature, 3rd edition. London: International Trust for Zoological Nomenclature. xx + 338 pp.

JAN, G. "1863" [1862]. Enumerazione sistematica degli ofidi appartenenti al gruppo Coronellidae. Archivio per la Zoologia l'anatomia e la Fisiologia, **2:** 213–330.

JAN, G., AND F. SORDELLI. 1879. Iconographie Générale des Ophidiens, Vol. 5, livr. 49, pl. II. Milan.

JOURDRAN, E. "1904" [1903]. Les Ophidiens de Madagascar. Paris: A. Michalon. 63 pp. + 30 pls.

KAUDERN, W. 1922. Sauropsiden aus Madagaskar. Zoologische Jahrbucher Abteilung für Systematik, **45:** 395–458.

KLAUBER, L. M. 1943. Tail-length differences in snakes with notes on sexual dimorphism and the coefficient of divergence. Bulletins of the Zoological Society of San Diego, **18:** 1–60.

———. 1945. Herpetological correlations. I. Correlations in homogeneous populations. Bulletins of the Zoological Society of San Diego, **21:** 1–101.

LIDDELL, H. G., AND R. SCOTT. 1968. A Greek-English Lexicon. Oxford: Clarendon Press.

MACPHEE, R. D. E. 1987. The shrew tenrecs of Madagascar: systematic revision and Holocene distribution of *Microgale* (Tenrecidae, Insectivora). American Museum Novitates, **2889:** 1–45.

MAJOR, C. I. F. 1896. On the general results of a zoological expedition to Madagascar in 1894–96. Proceedings of the Zoological Society of London, **1896:** 971–981.

Marx, H. 1958. Catalogue of type specimens of reptiles and amphibians in Chicago Natural History Museum. Fieldiana, Zoology, **36**(4): 409–496.

Mertens, R. 1933. Die Reptilien der Madagaskar-Expedition Prof. Dr. H. Bluntschili's. Senckenbergiana Biologica, **15**(3/4): 260–274.

Mocquard, F. 1895a. Sur les reptiles recueillis à Madagascar de 1867 à 1885 par M. Grandidier. Bulletin de la Société Philomathique de Paris, ser. 8, **7:** 93–111.

———. 1895b. Sur une collection de reptiles recueillis à Madagascar par MM. Alluaud et Belly. Bulletin de la Société Philomathique de Paris, ser. 8, **7:** 112–135.

———. 1904. Description de quelques reptiles et d'un batracien nouveaux de la collection du Muséum. Bulletin du Muséum National d'Histoire Naturelle, Paris, **10:** 301–309.

———. 1908. Description de quelques reptiles et d'un batracien nouveaux de la collection du Muséum. Bulletin du Muséum National d'Histoire Naturelle, Paris, **14:** 259–262.

———. 1909. Synopsis des familles, genres et espèces des Reptiles écailleux et des Batraciens de Madagascar. Nouvelles Archives du Muséum, Paris, 5 ser., **I:** 1–110.

Morgan, E. C. 1973. Snakes of the subfamily Sibynophiinae. Ph.D. dissertation, University of Southwestern Louisiana, Lafayette. xiv + 260 pp.

Myers, C. W. 1973. A new genus for Andean snakes related to *Lygophis boursieri* and a new species. American Museum Novitates, **2522:** 1–37.

———. 1974. The systematics of *Rhadinaea* (Colubridae), a genus of New World snakes. Bulletin of the American Museum of Natural History, **153**(1): 1–262.

———. 1986. An enigmatic new snake from the Peruvian Andes, with notes on the Xenodontini (Colubridae: Xenodontinae). American Museum Novitates, **2853:** 1–12.

Myers, C. W., and J. E. Cadle. 1994. A new genus for South American snakes related to *Rhadinaea obtusa* Cope (Colubridae) and resurrection of *Taeniophallus* Cope for the "*Rhadinaea*" *brevirostris* group. American Museum Novitates, **3102:** 1–33.

Myers, C. W., and J. A. Campbell. 1981. A new genus and species of colubrid snake from the Sierra Madre del Sur of Guerrero, Mexico. American Museum Novitates, **2708:** 1–20.

Nicoll, M. E., and O. Langrand. 1989. Madagascar: Revue de la conservation et des aires protégés. Gland, Switzerland: World Wildlife Fund. xvii + 374 pp.

Nobili, G. 1905. Descrizione di un nuovo potamonide di Madagascar. Bollettino dei Musei di Zoologia ed Anatomia Comparata della Università di Torino, **20**(507): 1–4.

Parker, H. W. 1925. New and rare reptiles and batrachians from Madagascar. Annals and Magazine of Natural History, ser. 9, **16:** 390–394.

Peracca, M. G. 1892. Descrizione di nuove specie di Rettili e Anfibi di Madagascar. Bollettino dei Musei di Zoologia ed Anatomia Comparata della Università di Torino, **7**(112): 1–5.

———. 1893. Descrizione di nuove specie di Rettili e Anfibi di Madagascar. Bollettino dei Musei di Zoologia ed Anatomia Comparata della Università di Torino, **8**(156): 1–16.

Pesantes, O. S. 1994. A method for preparing the hemipenis of preserved snakes. Journal of Herpetology, **28**(1): 93–95.

Raxworthy, C. J., and R. A. Nussbaum. 1994a. A rainforest survey of amphibians, reptiles and small mammals at Montagne d'Ambre, Madagascar. Biological Conservation, **69:** 65–73.

———. 1994b. A review of the Madagascan snake genera *Pseudoxyrhopus*, *Pararhadinaea*, and *Heteroliodon* (Squamata: Colubridae). Miscellaneous Publications of the Museum of Zoology, University of Michigan, **182:** 1–37.

Savitzky, A. H. 1981. Hinged teeth in snakes: an adaptation for swallowing hard-bodied prey. Science, **212:** 346–349.

———. 1983. Coadapted character complexes among snakes: fossoriality, piscivory, and durophagy. American Zoologist, **23:** 397–409.

Shine, R. 1983. Reptilian reproductive modes: the oviparity–viviparity continuum. Herpetologica, **39:** 1–8.

———. 1991. Intersexual dietary divergence and the evolution of sexual dimorphism in snakes. American Naturalist, **138**(1): 103–122.

UICN/PNUE/WWF (Union Internationale pour la Conservation de la Nature/Programme des Nations Unies pour l'Environnement/World Wildlife Fund). 1990. Madagascar: Profil de l'environnement. Gland, Switzerland, and Cambridge, England: UICN. xv + 439 pp.

Werner, F. 1929. Übersicht der Gattungen und Arten der Schlangen der Familie Colubridae III. Teil (Colubrinae). Mit einem Nachtrag zu den übrigen Familien. Zoologische Jahrbucher Abteilung für Systematik, **57:** 1–196.

Williams, K. L., and V. Wallach. 1989. Snakes of the World, Vol. 1, Synopsis of Snake Generic Names. Malabar, Florida: Krieger Publishing. viii + 234 pp.

Zehr, D. R. 1962. Stages in the normal development of the common garter snake, *Thamnophis sirtalis sirtalis*. Copeia, **1962:** 322–329.

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